

skin diver

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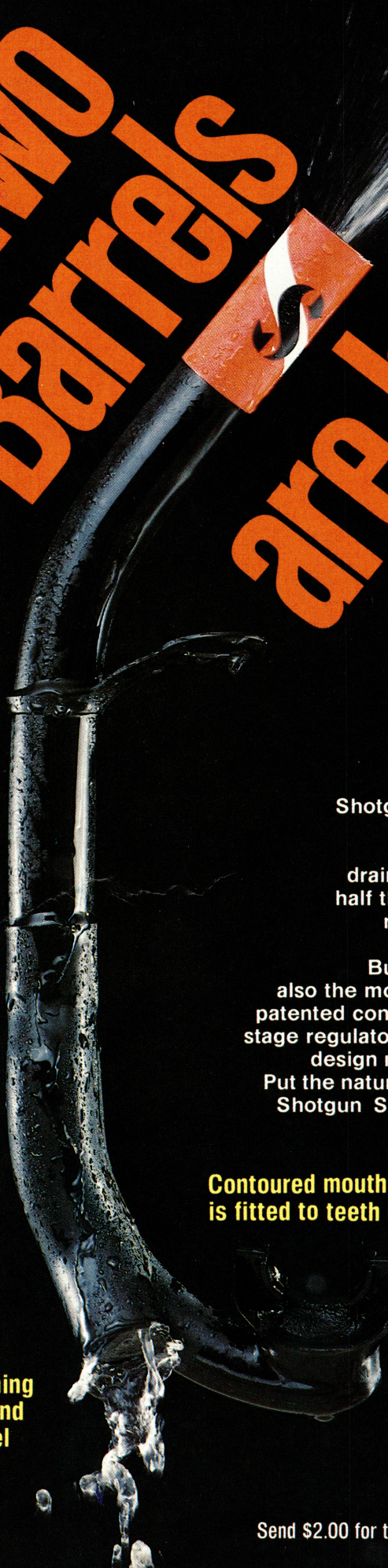
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- IN THE DARK ABOUT DIVE LIGHTS?
- NIGHTMARE LEGISLATION LOOMS FOR TREASURE DIVERS
- SDVI OFFERS A POTPOURRI DINE OF THE WIDE PACIFIC
- TEAM UP WITH WOLFIE AND WALDO



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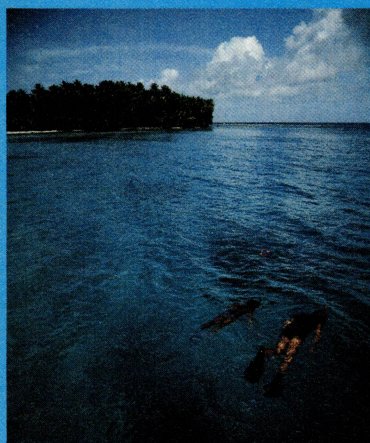
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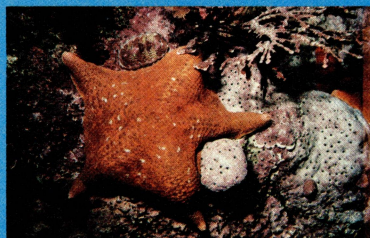
56/Why Wolf?



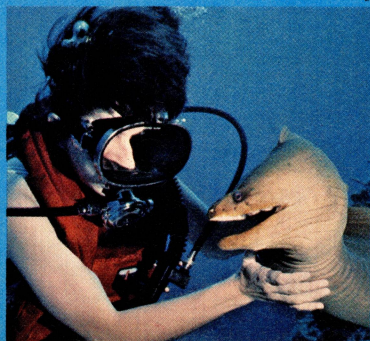
32/Treasure Troubles



88/Pacific Paradise



72/California Color



24/Mama's Moray

skin diver

Volume Twenty-Eight Number Four

PHOTOGRAPHY

- 24 THE WONDERFUL WORLD OF WALDO** JIM AND CATHY CHURCH
Making friends with a moray for fun and profit

WRECK DIVING

- 32 SHIPWRECK LEGISLATION** BILL BARADA
Another legal nightmare looms for wreck divers

EQUIPMENT

- 48 IN THE DARK ABOUT DIVE LIGHTS?** GEORGE COZENS
Part I: How to choose an U/W light to suit your particular needs

DIVE ADVENTURE

- 56 WOLFIE** RICK BROCK
Exploding the fierce monster myth about wolf eels
- 66 TEKNA'S T-2100 REGULATOR** PAUL J. TZIMOULIS
A racy little breathing machine with hair-trigger response

MARINE LIFE

- 64 THE FILE SHELL** GERI MURPHY
An incredibly beautiful bivalve adds excitement to Caribbean reefs

LOCAL DIVING

- 72 MENDOCINO** MARK E. GIBSON
Diving along the rugged coast of "the other California"

FOREIGN TRAVEL

- 88 DIVING THE WIDE PACIFIC** CARL ROESSLER
A survey of exotic dive sites from the Galapagos to the Coral Sea

DEPARTMENTS

- | | | | | | |
|----|-----------------|----|----------------|----|-------------------|
| 6 | U/W FORUM | 22 | FILM FESTIVALS | 60 | NEW GEAR |
| 16 | SHOWS 'N EVENTS | | 'N SYMPOSIUMS | 80 | FISH OF THE MONTH |
| 19 | SCUBA QUIZ | 40 | MEDIFACTS | 98 | DIVER'S DIRECTORY |

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COVER

Nose-to-nose with Waldo, the friendly moray, Cathy Church nudges the eel with her facemask, trying to keep him away from the baitfish hidden in her BC pocket. Photograph by Jim Church.

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SDM Editorial

BY THE PUBLISHER



Guardians of the Reef

A Caribbean dive resort owner sits down with his guests for breakfast. While the divers eagerly discuss the prospects of a good dive, the owner quietly selects a chair facing the sea. The shore front is barely 100 feet away and the view from the breakfast veranda offers a spectacular panorama.

The resort owner is a cordial host, but this morning he seems distant. His conversation is almost mechanical while he gazes out the window at a tiny speck some 500 yards up the beach. His attention is riveted on a small native fishing skiff. Three young boys, all locals, are fishing with handmade spears and goggles. Twenty minutes pass and by now the guests are happily savoring their eggs and pancakes, but their host becomes more grim by the minute. The small fishing boat has crept closer to the reef directly in front of the hotel.

Suddenly the host jumps up from the table, runs out the dining room door and boards a dive boat at the pier. He starts the engine and races over to where the boys are fishing. Shouting in half English and half island lingo, the dive resort owner orders the boys not to come any closer to his reef. The young fishermen move off in the opposite direction. For perhaps the hundredth time, the hotel owner has successfully driven off would-be poachers who would have otherwise shot out his reef.

Why was this dive resort owner so upset? The answer is simple: He was defending a beautiful natural resource which just happened to be his chief money-maker. Located directly beneath his boat lay one of the loveliest coral reefs on the island. Over the past six years he had spent thousands of hours taming the fish to the point that they would take food out of his hand. His menagerie of undersea creatures in-

cluded a 30 pound pet grouper, a pair of angelfish which would eat from your hand and a moray eel with the disposition of a puppy dog. His hotel was filled to capacity with dive guests who had come to his island specifically to see these wonderful fish. His hard work had paid off, but his problems were only beginning. In taming the creatures of the reef, he had made them vulnerable to even the most inept spearfishermen. The fish could no longer distinguish between human predator and human friend. In order to preserve his aquatic paradise, he had to maintain an almost 24 hour vigil over this piece of reef.

The scenario described above actually happened, and continues to happen almost daily throughout the Caribbean. There are literally hundreds of self-appointed guardians constantly watching over the reefs and the animals who live there. Most of them are dive-masters, dive instructors, dive boat skippers or dive resort owners who feel compelled to protect the undersea environment from the unwitting public. Almost daily they lecture visiting guests on the subject of marine conservation. They plead, cajole and frequently demand that visiting divers not shoot their fish, or pick their black coral, or destroy their seafans, or scoop up their living shells. Their struggle to save the reefs is an endless uphill battle for survival — survival for themselves as well as the marine environment.

The one bright hope in this battle for marine conservation is the fact that the dive resort operators have managed to make an impact on many of the island governments. By constantly educating and lobbying for marine conservation, these courageous people have frequently won the support of local governments. It is the divers who have made the difference, by awakening these governments to the need for conservation regulations.

The Cayman Island government has passed a Marine Conservation Law which makes it illegal for visiting divers to collect living marine organisms such as seafans, black coral, sponges, and tropical fish. The law also bans spearfishing with the use of scuba gear. The government has made provisions for setting aside certain coral reef areas as underwater parks and a study of reef sites is now underway.

The Bahamas have established a clear and concise code of marine conservation laws for visiting divers. It is now illegal to remove any type of marine life

from the reef or ocean floor with the use of scuba or a surface air supply system. Spearfishing is limited to the use of snorkeling equipment and either a Hawaiian sling or pole spear. All other types of spearguns are outlawed. It is also illegal to catch and export any type of marine organism, including lobster, live marine tropicals, black coral or speared fish. The Bahamas have also established at least four marine sanctuaries which have been designated as land and sea parks and where nothing may be touched or disturbed.

Just recently, the government of the British Virgin Islands declared the wreck of the *Rhone* a marine sanctuary and national monument. Both the wreck and the marine life on it are now protected from souvenir hunters, spearfishermen, and fish collectors. The same sort of thing is beginning to happen in Bonaire, Barbados, the U.S. Virgin Islands, and many other popular resort diving destinations. And it is not by accident that the islands which wisely protect their reefs are the same ones that enjoy a booming diving tourism business. Vacationing divers are not interested in visiting vacant parking lots or sandy deserts. They are motivated by clear water, living coral reefs and an abundance of marine life.

What has touched off this exciting chain reaction among the islands of the Caribbean? What has finally sparked government interest and public awareness over the need for marine conservation? First of all, the dive resort operators and hoteliers are beginning to place a precise dollar value on their marine environment. Pretty coral reefs and schools of fish can be converted into tourist dollars for their island economy. A pet grouper entertaining the guests on the reef may be worth thousands of dollars annually rather than the paltry five bucks at the local fish market. An intact coral reef complete with delicate seafans and colorful sponges could be worth hundreds of thousands of dollars yearly instead of the few bucks a curio shop gets for a dried out seafan or a broken-off chunk of brain coral. An exciting shipwreck loaded with schooling fish and brightly colored sponges may be worth up to one-half million dollars in tourist bookings as compared to the couple thousand dollars it could bring in scrap metal.

Another reason why conservation is working so well in the Caribbean is that most dive resort operators have come to realize that no one is going to protect the reefs but themselves. Most island gov-

(Continued on Page 110)

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Underwater Forum

Cenote Diver

I read Jim Chapman's article on cenote diving in the Yucatan with great interest. As a member of the staff of the American Consulate in Merida for over two years, I have had the opportunity to make cenote dives. And, I would have to agree with Chapman that a cenote dive is quite an experience.

Within 40 miles of Merida there are at least 50 cenotes. Not all have been explored — yet. But we are trying. We vary our diving here between the cenotes and the Gulf of Mexico with some trips to the Caribbean. We have found that Arrecife Alacran, about 75 miles due north of the port of Progreso, Yucatan, in the gulf to be equal to the Caribbean. One does have to camp out, though, on one of the five deserted islands within the reef.

It was fun reading about the Yucatan in SDM. When Chapman returns to the Yucatan, have him give us a call. . .

BILL FARNAN

MERIDA, YUCATAN, MEXICO

Why Weight?

I have some advice that many people could use involving cost cutting in the lead weight area.

First, buy a lead weight mold. Mine cost me \$8, but the investment is well worth it. Second, get the lead. I found a Firestone Tire Dealer tire balancer who would sell me all the old lead I wanted at \$3.50 for 25 pounds. That works out to under eight cents a pound. So after making two five pound weights your investment is paid off.

My next problem was how to melt the lead. The local scuba dealer said to use a Coleman stove, but I did not have one available. So I used the kitchen stove with the exhaust fan on high. For the melting pot I used an old kitchen pan.

Making my weights this way I have saved a lot of money.

DAVID FORSBERG
MINNEAPOLIS, MN

Rescue Botched

A recent article in The Miami Herald entitled, Plan to Get Help for Bends Victim Botched, shows that the safety of a diver is often dependent not only on the diver, but also on the support received should an accident occur.

An injured diver is at the mercy of support personnel. In very remote areas such incidences can almost be excused. However, when a diver is exposed to incompetence in an area where diving is

not only common, but an industry, it makes a body feel uncomfortable regarding chances of survival under similar circumstances.

How do we correct such injustice? What do we do to make certain this does not occur again?

JOHN W. KENNEDY
LAUREL, MD

Patience and Perseverance

The beginning of a new and very rewarding challenge in the field of scuba instruction began for me on October 16, 1978. This challenge was to teach six paraplegics and quadaplegics how to scuba dive. . .

During the first few lessons, we encountered a few difficulties which we overcame. The first of these was that our divers' feet were dragging on the bottom of the pool. We used wetsuit boots as protection and to create more buoyancy. Another problem was ensuring total buoyancy control underwater as well as on the surface. This was accomplished with the use of the Seatec Bluefin BC. We also discovered that the chill factor in the paraplegic divers was very high and this was helped by the use of a wetsuit top. The wetsuit bottoms, however, were a problem in some cases and we decided not to use them at all.

Our first paraplegic dive class consisted of one female and five male divers. All of them had more enthusiasm and determination than any individuals I have ever seen before. It was very rewarding to see these students roll up to the edge of the pool, lock the brakes on their wheelchairs, lift themselves into the pool, and swim to the other side in preparation for the day's lesson. . .

I have no doubt in my mind that these six divers will be an asset to the scuba diving world, and I am looking forward to the next group of paraplegic divers. . .

JIM HOLLIS
Scuba World
Orlando, FL

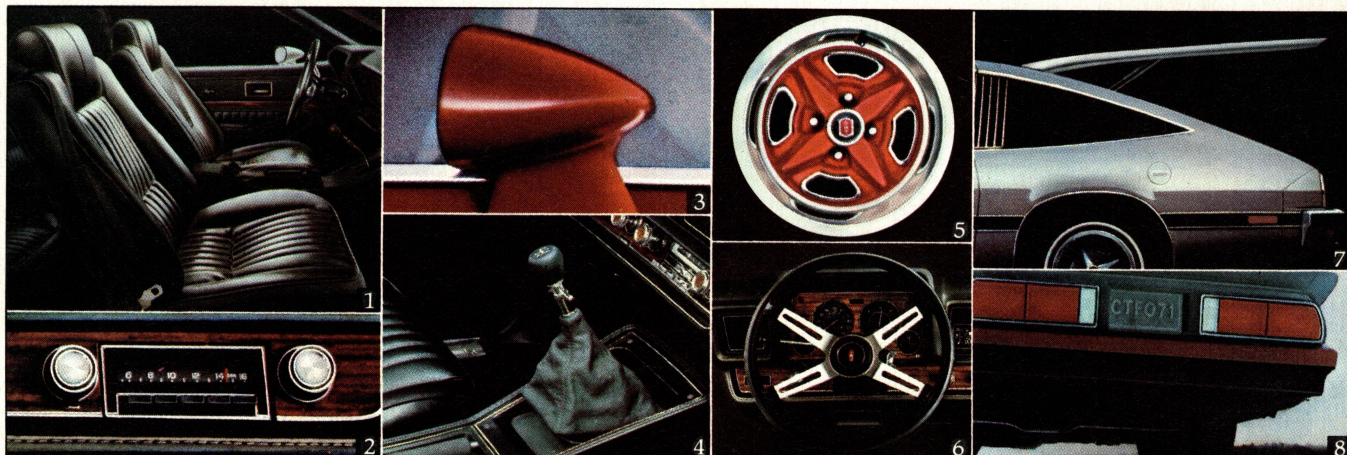
Pro-Spearfishing

Bill Barada's article, A Place For Spearfishing, in the January, 1979, SKIN DIVER was long overdue. I for one really appreciate that he has accurately set forth the fact that skin divers with spearguns are very, very inefficient at harvesting fish. On this coast it is not at all unusual for a commercial fisherman to harvest 15,000 to 20,000 pounds of

(Continued on Page 11)

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... my buddy transmitting over his SPORT-PHONE Diver C.B. He was about 40 feet behind me and out of sight, but the message came through loud and clear.

'Get over here,' he said.

I transmitted back,

'What did you find?'

'Dinner for six!'

'Say again?'

'The Loch Ness lobster.'

'On my way.' When I reached him, Dave was hovering in front of a crevice.

Apparently, the bug had scuttled into cover before Dave could get his hands on him.

'It's a big bull... got himself stuck in there.'

I could see the bug's feelers waving just inside the crevice.

If Dave tried pulling the feelers, the bug would just shed them.

Dave said, 'Any ideas?'

'Reach in and push him,' I said.

'Okay.'

'And watch out for morays.'

'Thanks.' Pushing the bug freed its locked-in





DIVING FOR LOBSTER SUDDENLY I HEARD...

spines. A moment later he was in the goodie bag. 'Let's mark this spot... come back for more tomorrow.'

'Roger.' I secured my WET-BEACON™ to the crevice, then we headed for the surface.

That night, during our feast, we both agreed that talking to each other down there made diving more fun and gave us a new kind of freedom underwater. I mean, it really expands your whole diving experience."

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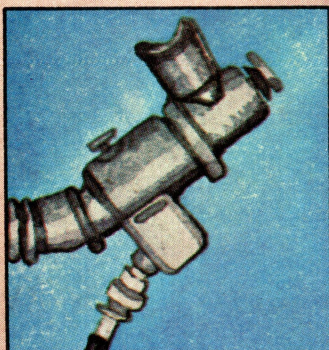
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UNDERWATER FORUM

(Continued from Page 6)

snapper in a single 10 to 12 day trip using primitive hook and line. I would dare say that most entire dive clubs will not harvest that many pounds in 10 years. I most certainly can understand the sentiment of those who feel that killing is wrong, even the killing of fish. But, as Barada points out, such an emotional judgment should not and cannot ride the popular tide of ecology and environmentalism. . .

I feel very strongly that there is a place for spearfishing just as there is a place for underwater photography, shell collecting and fishwatching.

FARLEY SONNIER
LAFAYETT, LA

Yellow Journalism?

As an active sport diver, I wish to congratulate you on the concern exemplified by your article on page 40 of SKIN DIVER Magazine (November 1978) entitled Battle of the Sludge [by Bill Barada]. There is certainly a need to be concerned about ocean dumping as your article points out; however, I would like to point out some rather misleading statements which tend to weaken the impact of your article and put it in danger of being labeled "yellow journalism" or "sensationalism."

There is no way that the nutrient value of secondarily treated sewage sludge, such as that dumped off New York City, can be compared to the composted sludge used in basic agriculture by European countries or the State of Missouri. Nor it is correct to compare the result of high oxygen demand waste in enclosed freshwater lakes or saltwater bays and estuaries to similar dumping in an open ocean bight where the residence time of water is in the order of 100 days or so.

I suggest that, in the future, your articles would have much more impact if these and similar statements were avoided. There are adequate sources of information available to you as a taxpayer which could help you in this regard. For example, regarding the natural versus sludge-caused theories of the "1976 anoxia episode," you are surely aware of the extensive NOAA data base available for the New York Bight before, during and after the event. This data is about to be published in a comprehensive interpretive volume in which I am sure you will be interested. Until it is published, there are any number of NOAA scientists, including myself, who can help you by answering questions.

DONALD K. ATWOOD, Director
Ocean Chemistry Laboratory
NOAA, Miami, FL

My thanks for your comments on my

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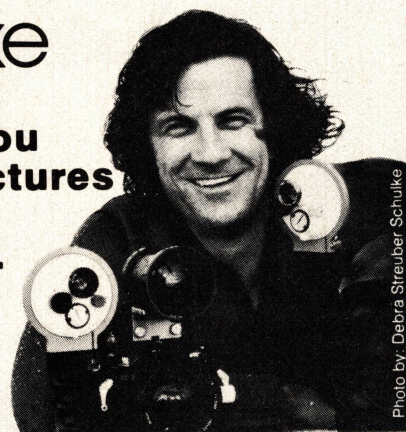
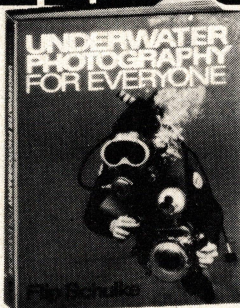


Photo by Debra Streuber Schulke

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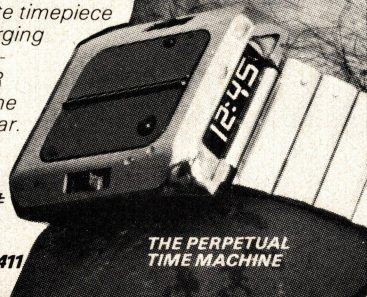
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article. The offer of help in preventing future "misleading statements" and in avoiding a charge of "yellow journalism" is appreciated. It is indeed refreshing to learn that a NOAA scientist is concerned about ocean dumping. The examples you cite, however, indicate that you either did not read the article carefully, or that you deliberately distorted my statements in order to cast doubt on the article's credibility.

You imply that New York's secondarily treated sludge is entirely different from the European sludge that is composted for use in agriculture. The fact is that New York sludge is unsuitable for composting because it is loaded with toxic compounds that can enter the food web and present a hazard to human health. The required corrective measures are well known. It is equally well known that these toxic compounds become concentrated in the marine food web, and present a hazard to human health.

You also state that oxygen demanding wastes do not produce the same effects in an open ocean bight as they do in an enclosed body of water. This is only partially true. The results take longer in the ocean due to its greater volume. However, your statement implies that dilution is the solution to pollution in the ocean. This assumption (upon which NOAA and EPA interpretations of data are based) is highly questionable. The deterioration of marine life in polluted areas off our coast bears mute testimony that the theory of dilution is as great a fallacy in the ocean as it proved to be for inland waters.

I will indeed be interested in the comprehensive volume that NOAA is preparing. Perhaps it will provide material for a third SKIN DIVER article.

BILL BARADA

SDM Environmental Editor

New England Wreck

It was with much delight and nostalgia that I read the article by Paul Adler and Jack Hinz on New England's Latest Shipwreck (SDM Nov. '78). During the spring and summer of 1977 I had the pleasure of making a number of dives with other members of the Sea Roamers Dive Club of Leominster, Mass., on that same great wreck. With skipper Ray Genest at the wheel of *Sweet Thing*, we dropped anchor many times on the wreck of the *Chester A. Poling*, and cherish many a souvenir from her . . .

But, we were curious to read that the authors, who found some of the ship's logs, wrote of the ship as the *Chester A. Polling*, yet the kapok life jackets we still have from this vessel spell the name *Pol-*

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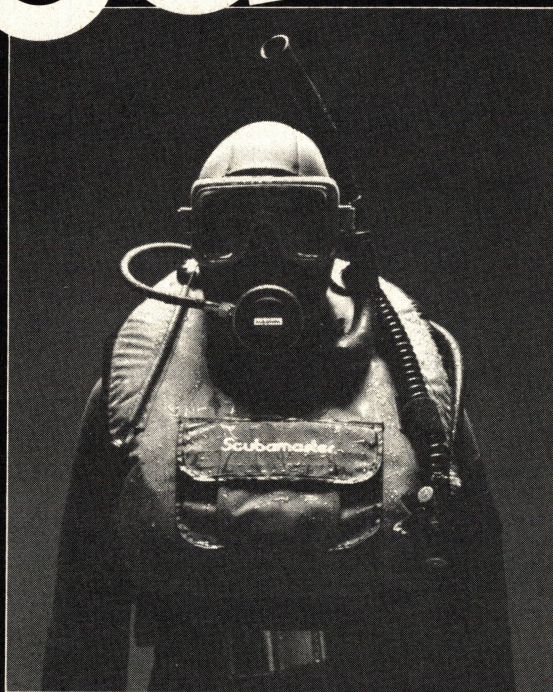
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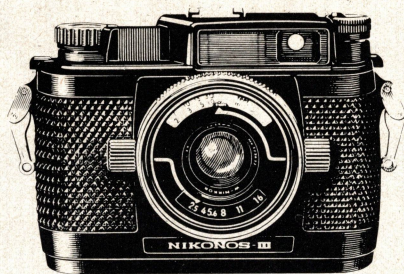
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ing, with only one "L." This is the same spelling that Dick shows in the snapshot he took of the stern — before the divers removed the brass letters. We would like to learn if, somehow, we stumbled upon contradictory data and would appreciate Mr. Adler and Mr. Hinz checking the logs. Also, this wreck was moved a considerable distance in the infamous Blizzard of '78, and anyone who can provide the coordinates for its new resting place will undoubtedly earn the gratitude of a whole generation of divers.

BILL KLEIN
BASKING RIDGE, NJ

No Dough

In reference to your editorial, Drop-outs — A Haunting Problem, (Dec '78 SDM) . . . I dropped out four years ago because I simply could not afford to buy all the equipment.

I guess inflation has hit a lot of us. I wish I had an answer. If I did, I'd be diving now.

RICHARD EVEY
BAKERSFIELD, CA

Sport-Phones

Having read several articles in recent issues of SKIN DIVER on Sound-Wave Systems equipment, I thought you might be interested in my experience with the Sport-Phones which I purchased in April of last year.

First, I would not suggest that novice divers further complicate their early diving experiences with any extra paraphernalia. However, for experienced divers, the Sport-Phones can add an entirely new dimension to diving. I took the advice in the instruction manual and practiced with the equipment with my dive partner for several hours in the local dive shop pool. Since the majority of my diving is done on New Jersey wrecks in relatively deep water (70-100 feet), I wanted to feel entirely comfortable before taking the plunge!

We quickly learned that the clarity of communication is almost exclusively dependent upon the person speaking. If the speaker enunciates his words clearly and uses common CB techniques, the comprehension level probably exceeds 90 percent. As with a normal CB, you get used to listening, and your comprehension improves as you gain experience. I've found that the Sport-Phone works well at depths of 90 feet and at a distance of at least 100 yards . . .

If I sound high on the Sport-Phone, it's because I am. Underwater communication is undoubtedly a long-neglected facet of our dive experience and one that needs more attention . . .

BOB ELIEZER
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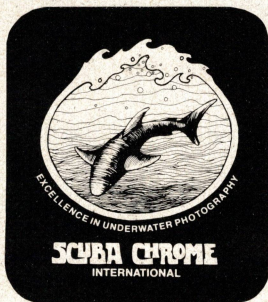
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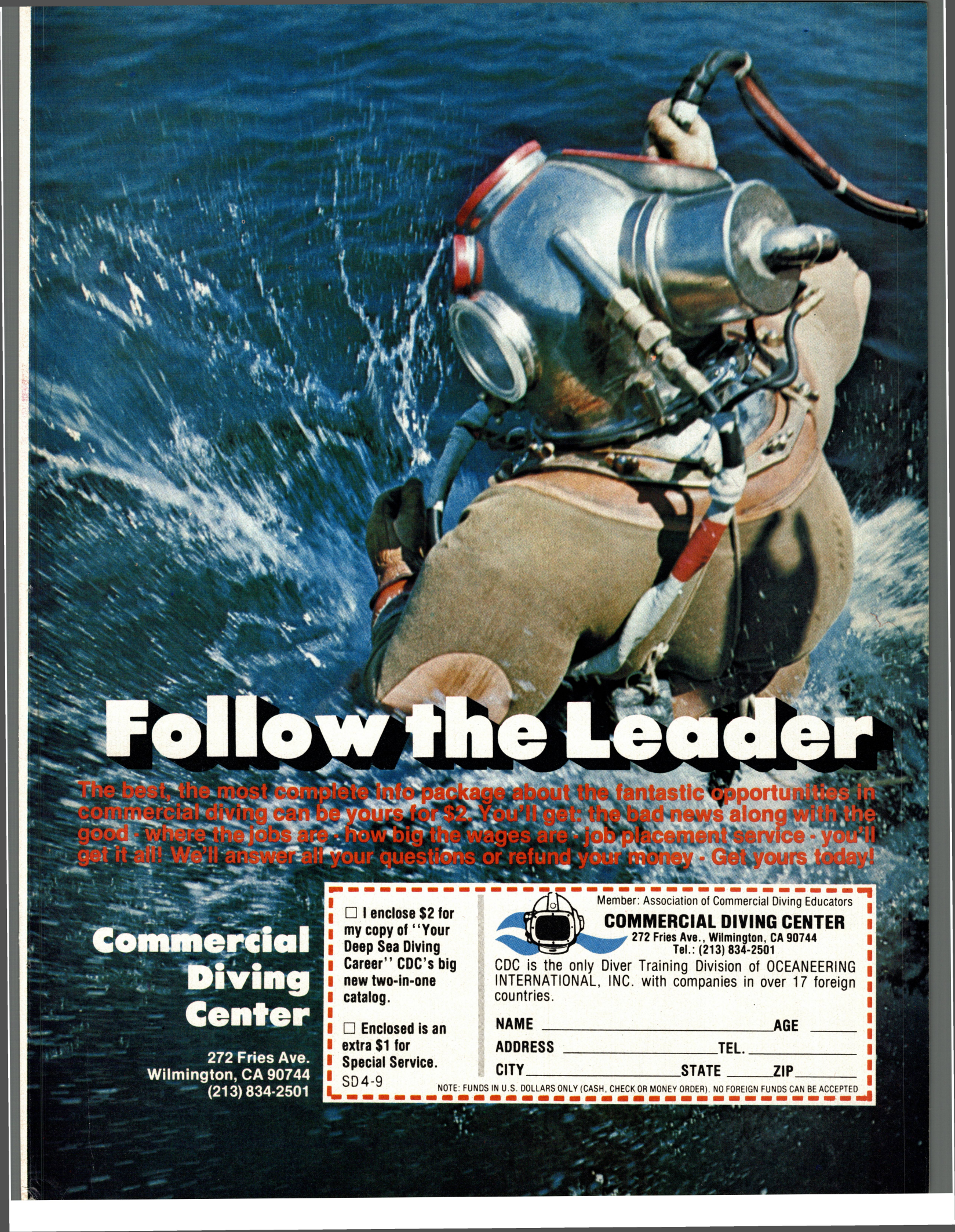
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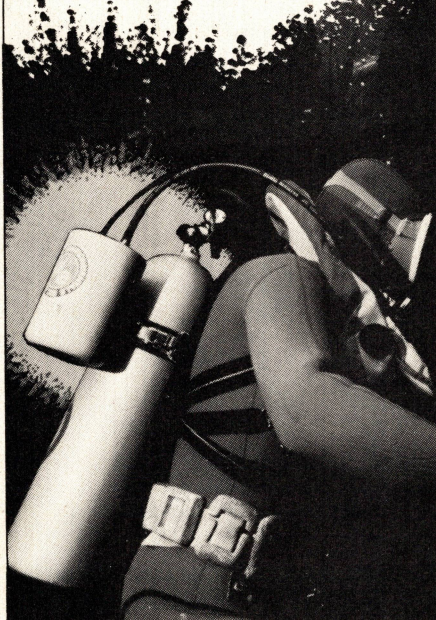
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April 7 Dive to Adventure III, the Stan Waterman Show, Westchester Community College, Valhalla, NY (Contact: Scuba Sport Rites Club, PO Box 644, Rye, NY 10580)

April 21 NAUI Underwater '79, Underwater Symposium, Harvard Univ., Cambridge, MA noon-6 pm (Contact: Fred Calhoun, PO Box 291, Back Bay Annex, Boston, MA 02117)

April 21 25th Underwater Film Review, John Hancock Hall, Boston, MA 8 pm (Contact: Fred Calhoun, PO Box 291 Back Bay Annex, Boston, MA 02117)

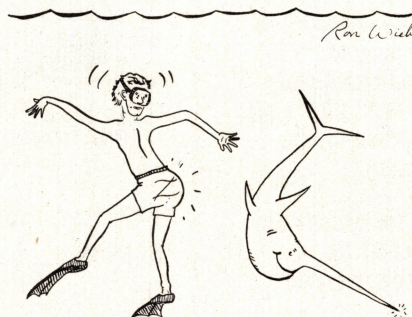
April 25 Photo contest deadline/Seaspace '79 (Contact: Dick Zingula, PO Box 4362, Houston, TX 77210)

April 28 3rd Annual New Jersey Council of Diving Clubs Symposium, Monmouth Mall Civic Auditorium, Eatontown, NJ, noon-5:30 pm (Contact: Dean & Judy May, El Hillside Ct., Highlands, NJ 07732)

May 4-5 9th Our World-Underwater, Raddison-Chicago Hotel; Sat., Film Festival, Medinah Temple Auditorium, 8 pm (Contact: Our World-Underwater IX, PO Box 4428, Chicago, IL 60680)

May 19-20 Seaspace '79, University Center Bldg., Univ. of Houston, 9 am-5 pm (Contact: Dick Zingula, PO Box 4362, Houston, TX 77210)

June 15-17 Oceans 79, Monash Univ., Melbourne, Victoria, Australia. Speakers Sir Robert Marx, Dr. Paul Dayton, J. McNulty, Ron & Val Taylor (Contact: Peter Stone, The Oceans Society of Australia PO Box 4604, GPO Spencer St., Melbourne, Victoria, Australia 3001)



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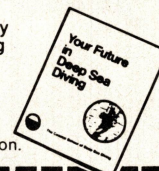
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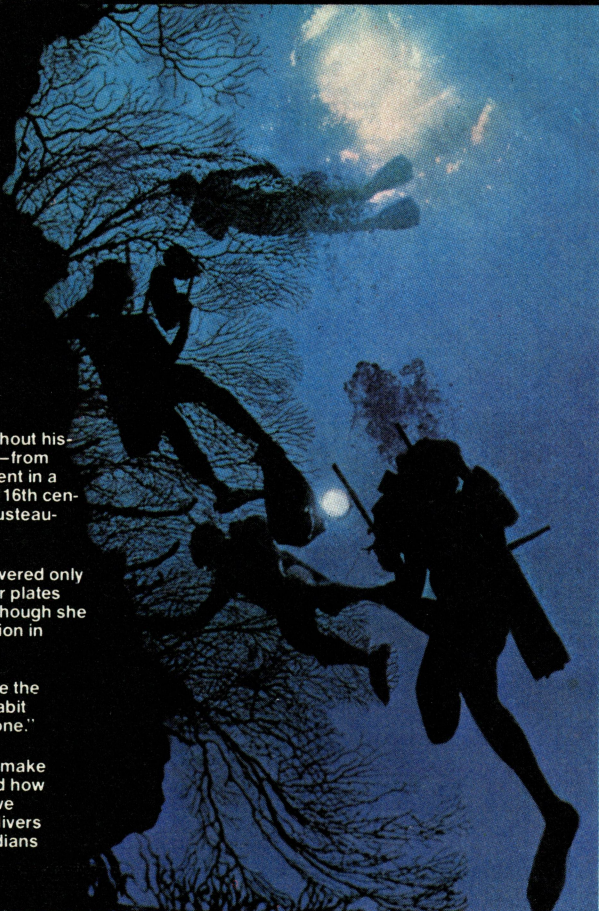
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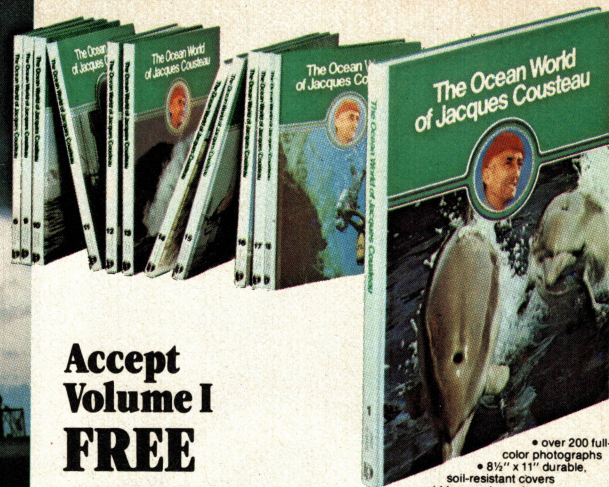
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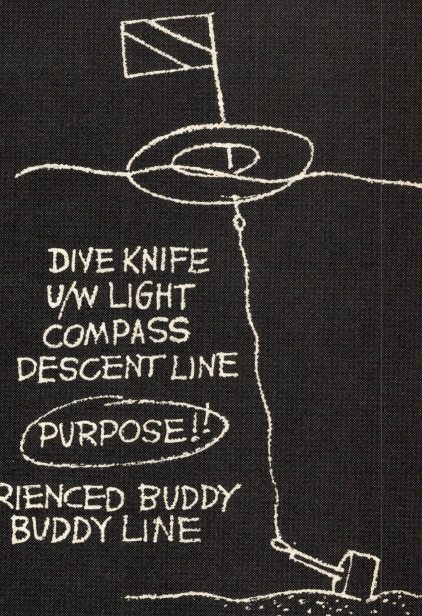
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SDM SCUBA QUIZ



Category: Limited Visibility

By Dennis Graver

When visibility is limited to less than ten feet, diving procedures need to be modified. Hazards increase in turbid water and special techniques are required to assure safety. Test your knowledge of limited visibility diving by answering the following questions. Answers are on the next page.

1. Select the most important prerequisite for a dive when visibility is less than average for the area.

- ☐ A. A good dive buddy
- ☐ B. A proper dive plan
- ☐ C. A need for the dive
- ☐ D. Limited visibility diving experience.

2. Which of the following groups of equipment is particularly important for limited visibility diving?

- ☐ A. Dive knife, underwater light, and compass
- ☐ B. Surface float, marker buoy, and dive knife
- ☐ C. Gloves, underwater light, and signaling whistle
- ☐ D. Compass, surface float, and extra weight

3. A descent line is recommended for use in limited visibility diving to:

- ☐ A. Control the rate of descent
- ☐ B. Prevent disorientation
- ☐ C. Lead to the starting point
- ☐ D. All of the above

4. The method of buddy contact most practical for limited visibility diving is:

- ☐ A. A leader-follower arrangement
- ☐ B. Side-by-side with visual contact
- ☐ C. Direct physical contact
- ☐ D. Use of a buddy line

5. Which of the following buddy system difficulties is the most significant in limited visibility diving?

- ☐ A. Identifying your buddy
- ☐ B. Maintaining contact
- ☐ C. Signaling your buddy
- ☐ D. Sharing air with a buddy

6. When visibility is poor, air consumption usually increases because:

- ☐ A. The water is colder
- ☐ B. The water is denser
- ☐ C. You must exert more
- ☐ D. Anxiety is greater

7. The most effective way to signal your buddy in limited visibility is with:

- ☐ A. Visual signals
- ☐ B. Audible signals
- ☐ C. Tactile signals
- ☐ D. An underwater slate

8. Which method of navigation is recommended for limited visibility diving?

- ☐ A. Natural navigation
- ☐ B. Dead reckoning
- ☐ C. Compass navigation
- ☐ D. Pilotage

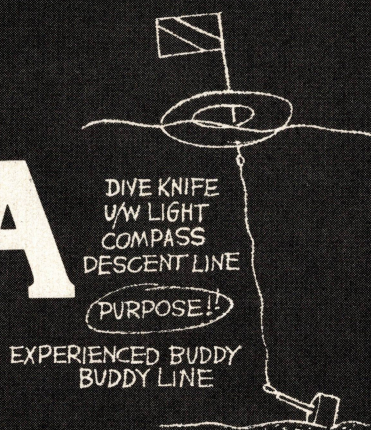
9. For limited visibility diving, an underwater light is:

- ☐ A. Always essential
- ☐ B. Useful except in very turbid water
- ☐ C. Of little value in most instances
- ☐ D. Required in some states and counties

10. Which of the following problems would not be likely to occur during an ascent in limited visibility?

- ☐ A. Difficulty in orienting yourself
- ☐ B. Difficulty in judging your rate of ascent
- ☐ C. Running into some object
- ☐ D. All of the above could occur

SDM SCUBA QUIZ



Answers: Limited Visibility

1. C. A need for the dive.

Above all, an objective is needed. If you don't need to dive in unfavorable conditions, avoid the hazards involved.

2. A. Dive knife, underwater light, and compass.

These items are especially important in turbid water. The risk of entanglement is increased, light levels are quite low, and disorientation can occur easily without a compass.

3. B. Prevent disorientation.

When visual references are lost, vertigo and disorientation can occur, nearly panicking some divers. A line provides a reference, even if only felt, and prevents disorientation.

4. D. Use of a buddy line.

Physical contact is almost mandatory when visibility is poor. Direct contact greatly restricts activity, but a properly used buddy line maintains contact and allows communication.

5. B. Maintaining contact.

All of the difficulties listed can be problems in dirty water. Be sure you can identify your buddy, work out signals in advance, and practice emergency procedures. The biggest problem, though, will be staying together, so concentrate on coping with that problem.

6. D. Anxiety is greater.

In dark, turbid water, apprehension is greater than in bright, clear waters. Some divers even feel claustrophobic in limited visibility. These anxieties affect respiration and increase your breathing rate. Check your submersible pressure gauge frequently.

7. C. Tactile signals.

Line pull signals with a buddy line are very effective. Use standard line pull signals rather than making your own. Discuss and agree on signals before the dive. Dive in limited visibility only with familiar buddies.

8. C. Compass navigation.

Except for tethered diving, which is beyond the scope of recreational diving, a compass is essential for a reference in limited visibility diving. Set and follow a course to keep track of your position in relation to your starting or ending point.

9. B. Useful except in very turbid water.

Unless the water is extremely dirty, a light will help you discern objects. If excessive amounts of particles are suspended in the water, however, the light will be scattered, reflected, and of little use.

10. D. All of the above could occur.

Disorientation is likely on ascent as well as descent. Watch your bubbles. Keep one hand overhead for protection. Count seconds and refer to your depth gauge to judge your ascent rate. A line is recommended for reference whenever possible.

Limited visibility diving requires special training and proficiency in diving skills. The chances of entanglement, disorientation, injuries, and other hazards occurring are increased. Know what you are doing, have an objective, and dive cautiously and conservatively. Diving is more enjoyable in clear water, so always seek as much enjoyment as you can.

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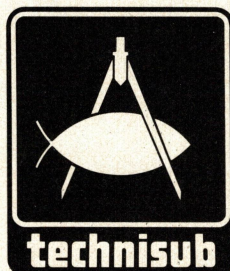
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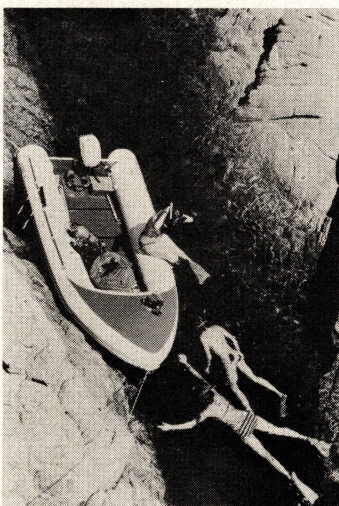


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Film Festivals 'n Symposiums

JACK MCKENNEY FILM FESTIVAL

The Monterey Dive Center, in Monterey, Calif., is sponsoring a Jack McKenney Film Festival to help raise funds for a new double-lock recompression chamber, serving divers in the Monterey Peninsula area.

The three hour program will feature six films by Jack McKenney including, *Behind the Scenes of THE DEEP*, and Jack's newest film, *God's Other World: The Red Sea*. All profits from the festival will be donated to the Pacific Grove Marine Rescue Unit to upgrade its recompression chamber treatment facility.

Monterey, Pacific Grove and Carmel are the most popular and heavily dived areas in central and northern California. The Pacific Grove Marine Rescue Unit has been actively operating a smaller, single-lock chamber there for 12 years. The larger chamber will allow more extensive treatment and eliminate the need to transport patients to San Diego.

The film festival will be held at Monterey Fairgrounds Agriculture Hall at 8:00 pm, Saturday, April 21. Tickets are \$4.50 and may be obtained at various Monterey Peninsula dive shops, or by calling or writing the Monterey Dive Center, 763 Lighthouse Avenue, Monterey, CA 93940; telephone (408) 375-6363. Tickets will also be available at the door.

OUR WORLD- UNDERWATER

The Our World-Underwater program will be held in Chicago on May 4, 5 and 6, 1979. In its ninth year of production, it is respected throughout the dive field as one of the best and most professionally produced programs in diver education.

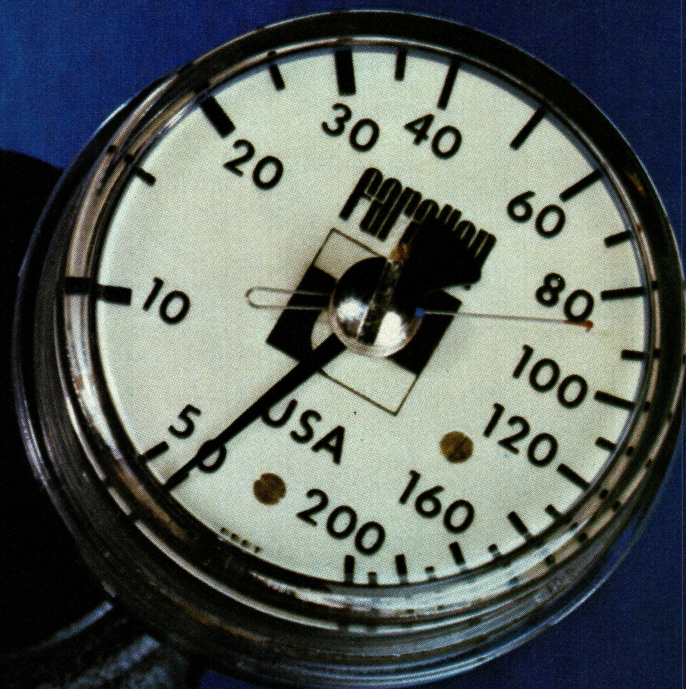
The program starts on Friday evening at the Raddison-Chicago Hotel, 505 N. Michigan Avenue on the Miracle Mile of downtown Chicago. The Raddison has arranged special prices of \$30, almost one-half of their regular rates, for double occupancy. In addition, they have special rates for triples and quads.

Friday's program begins with a cocktail party reception in the exhibit area where over 40 special interest booths will be set up, displaying advanced diving and photographic equipment, travel locations, antique bottle collections, underwater wreck artifacts, certification programs, resorts from all over the Caribbean and the world, underwater oriented scholarships, art and subjects of

(Continued on Page 28)

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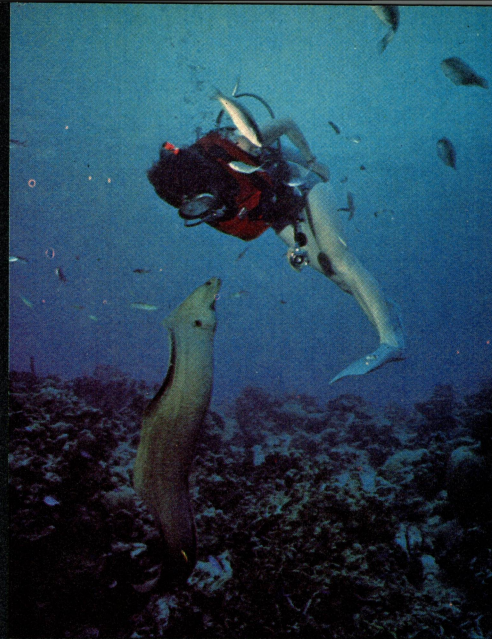
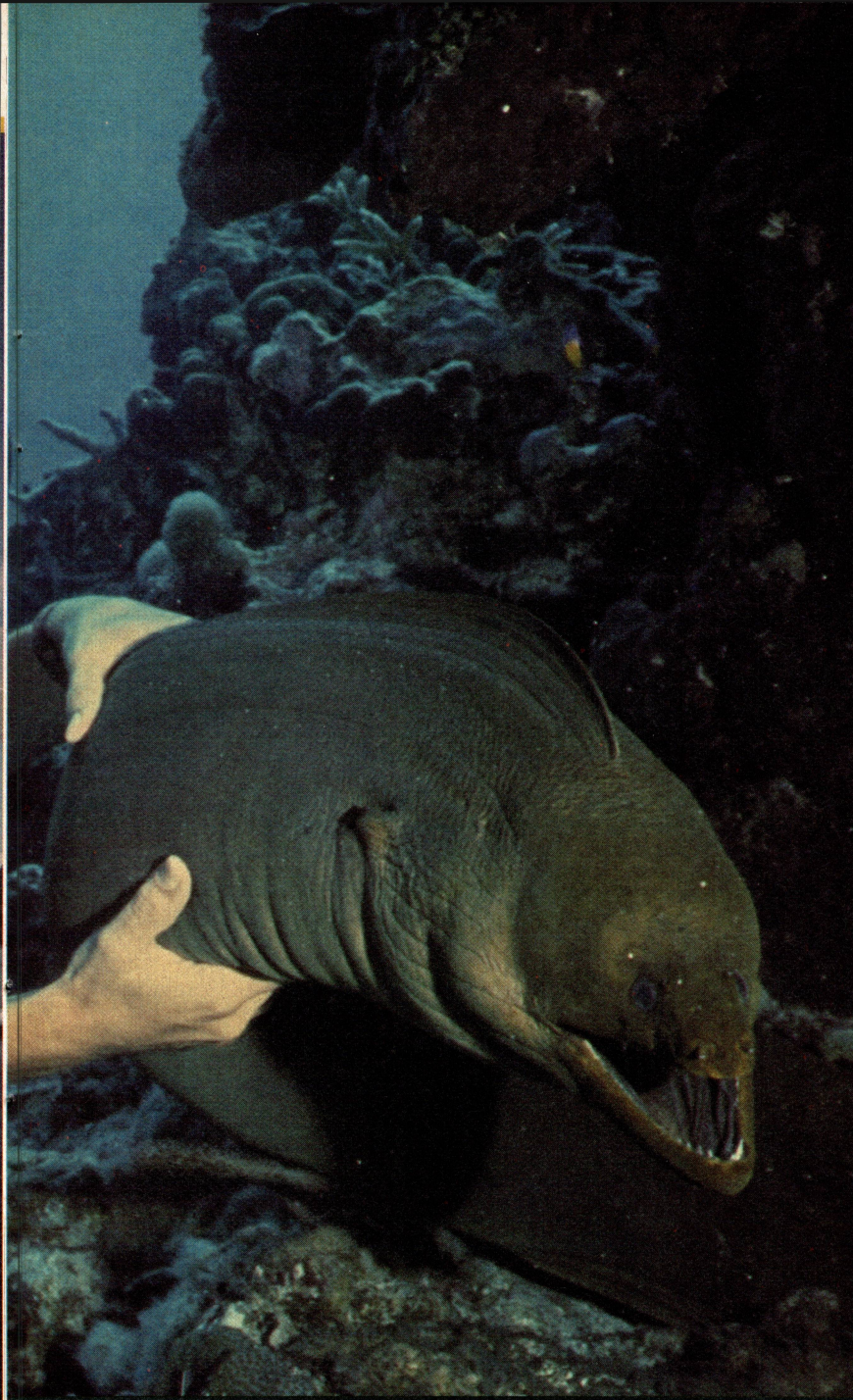


the wonderful world of

WALD

an
inside look
at how these
fantastic pictures
were made

By Jim and Cathy
Church



Waldo's behavior depends upon his appetite. So, during her first encounter with the six-foot eel, Cathy Church (above) wisely keeps her distance. Then Waldo (below) discovers the bait-fish hidden in Cathy's BC pocket. At left, Waldo has had enough and he quietly slithers away.



We had heard stories about a large, friendly eel, named Waldo, who lived in front of the Casa Bertmar Resort, at Grand Cayman. "He swam right between me and my camera!" a friend told us. Since we were at Grand Cayman, we decided that Waldo was for us. Jim was excited about photographing Cathy posing with a six-foot eel. He wanted an entire picture story, with long, medium and close-up shots, that Cathy could blend into a slide show. Cathy and Waldo posed together, Jim got his pictures, and we would like to share the story of working with Waldo with you.

DOING OUR HOMEWORK

Before meeting Waldo underwater we wanted to learn as much as we could about him. Did he move fast or slow. Were his movements erratic or predictable? We began by talking to Doyce Hemphill, the dive instructor who had been hand-feeding Waldo for several years. He told us that Waldo's behavior varied, depending on how hungry he was. If he was satisfied, he would remain quietly in his lair. But if he was hungry, he would sometimes come out and even circle around you while looking for a fishy handout. And at times, Waldo would simply disap-

pear for a few days — and no one knew where he went.

Doyce explained just how to feed Waldo. It is important to not tease him. If you draw him out of his lair with food, give it to him. If you let go of the food, and Waldo misses it at first, don't reach out and try to take it back. The last diver who tried to retrieve food reached it at the same instant Waldo did, and ended up with 12 stitches in her hand. (Although we know she had accidentally put her hand in Waldo's mouth, more sensational writers would have said that the "wild animal" had savagely attacked

her.) After explaining the fine points of eel feeding, Doyce offered to guide us on our first dive to meet Waldo. But, after this introductory dive, we would be on our own as Doyce had to tend to his student divers.

THE FIRST DIVE

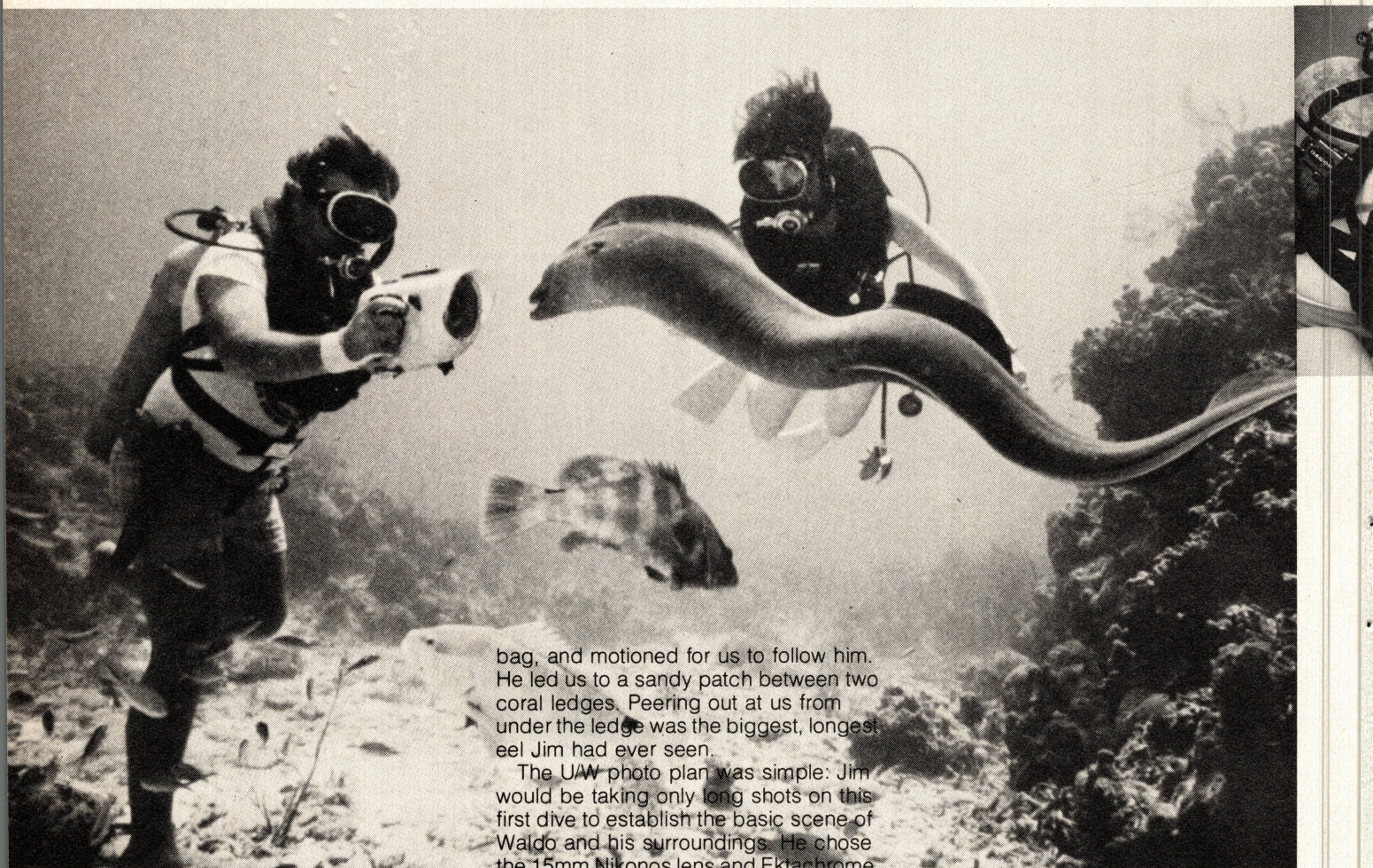
We snorkeled to the site and settled on the bottom. Cathy took off her large fins and booties and put on a smaller pair of blue fins for posing. Jim turned on his

strobe and carefully checked his camera and exposure meter settings. We were ready for the big moment!

Doyce opened his dive bag and began feeding a growing army of fish. Jim was confused. Why bother with two million wrasses, conies and groupers when we were looking for Waldo? Jim assumed that Waldo must have been out for the day, so he took several shots of the feeding frenzy. Doyce released another large handful of food into the water, closed his

quickly, but we had learned a lot about Waldo.

We set up our E-6 system and processed the film that evening. We had some fair upward silhouettes and long shots. Cathy's blue bikini and blue fins looked good, and the bright red BC added an important touch of color. But, the pictures just weren't sharp enough. Jim had been working from too far away, and camera and subject movement during the 1/60 second sunlight



Expecting a fishy handout, Waldo emerges from his lair to greet his old friend, dive instructor Doyce Hemphill. Doyce warned the Churches that it is important not to tease Waldo. If you draw him out of his lair with food, give it to him; don't try to take it back.

bag, and motioned for us to follow him. He led us to a sandy patch between two coral ledges. Peering out at us from under the ledge was the biggest, longest eel Jim had ever seen.

The UAW photo plan was simple: Jim would be taking only long shots on this first dive to establish the basic scene of Waldo and his surroundings. He chose the 15mm Nikonos lens and Ektachrome 200 — the wide-angle lens and high speed film would give enough depth of field so he wouldn't have to bother changing the focus control. And for fill lighting, he chose the wide-beam Subsea Mark 100. Being nervous about crowding a strange eel, Jim started with some very long shots, but moved in closer as he watched Doyce feed Waldo some fish and touch the eel's head.

Cathy — who would be posing with Waldo — concentrated solely on the eel. She studied his behavior and watched Doyce maneuver him. Jim concentrated on keeping his distance from the eel, while still trying to take pictures. He also studied the U/W terrain for possible set-ups that we could talk over and plan for the next dive. Doyce caught our attention and tapped his dive watch — we were out of bottom time, film and food all too

exposures blurred some of the images.

How could we get better pictures on the next dive? We could use a more powerful strobe to cut down on the sunlight exposure, but Jim was afraid that more strobe lighting would seriously overexpose Cathy's light skin while underexposing Waldo's dark green skin. We considered using a flashbulb system, which would allow us to use a faster shutter speed, but Jim didn't want the hassle of changing bulbs. The odds of being able to take the picture at just the right moment were too small, and using bulbs would make critical timing and rapid shooting impossible. Our conclusions were that Jim would have to get closer and hold the camera steadier, and that Cathy would have to maneuver Waldo as slowly as possible.

THE SECOND DIVE

We had no trouble finding Waldo — he was peering at us from under the same coral ledge when we reached the site. Cathy changed to her blue posing fins and slowly moved toward Waldo with a bag of baitfish. Jim maneuvered himself into position to separate Cathy and Waldo from the coral background with an upward camera angle. Cathy removed a baitfish from the bag and held it about a foot in front of Waldo's nose. No sooner



As Cathy gets braver, she tries to coax Waldo out into the open for a photo session. But, today the underwater star isn't hungry. He's had his fill of fish.

had Waldo started to move toward the bait than a coney darted in, grabbed the fish, and fled — leaving Cathy facing Waldo empty handed! She quickly opened the bag and released another fish which Waldo swallowed in one gulp. However, in her understandable haste, she opened the bag too wide and some additional fish floated out. This caused a feeding frenzy among the mob of fish which now surrounded us.

Now we understood why Doyce had stopped to feed these greedy, pesty fish before approaching Waldo on that first dive. He had put out food to create a feeding frenzy, and then had slipped away from the fishy mob to Waldo. We wouldn't omit this important step next time. Besides upsetting our feeding session with Waldo, some of the more aggressive conies had bitten Cathy's fingers several times and had even drawn blood. The scene was a mess! We would have to try again.

THE THIRD DIVE

We recruited Christy Smith, a good friend and photographer, to help us by luring the reef fish away with a feeding frenzy. We loaded her down with a loaf of bread and a bag of fish (sounds like another story) to feed the masses. Christy played the role of a decoy quite well and was only bitten once while doing it.

Cathy understood Waldo's timing better. She would draw him out with a baitfish, but would not let him have it right

away. We were using a more expensive fish — almost \$4 a pound — which would photograph well and which wouldn't break up in the water. Waldo ate better than we did for a few days, but we aren't sure if the IRS will understand this particular expense.

We wanted to draw Waldo completely out from under the ledge so Jim could get a shot of Waldo and Cathy together against a bluewater background. But Jim didn't have much time to compose and take the pictures. No sooner would Waldo get his fish than he would swim backward very rapidly, swinging his body from side to side, to his lair. Cathy finally lured Waldo into position and would soon have to give him his fish. Jim, with fins off, stood on the bottom in a crouching position with his feet apart to steady the camera. However, not realizing that he was standing between Waldo and his lair, Jim danced like a ballerina when Waldo scooted tail first between his legs! Jim pounded his chest to get his heart started again, and Christy (who had slipped away from the feeding frenzy) almost drowned laughing.

THE FOURTH DIVE

It was time to move in for medium-distance shots with a Nikonos 28mm lens. Jim wasn't particularly interested in getting closer to Waldo, but he needed a smaller picture area. He also wanted Waldo to the left of the picture so his darker body would be closer to the strobe, and so the strobe would light Cathy's face within her mask without overexposing her skin. We considered having her wear a thin wetsuit which wouldn't reflect as much light as bare skin, but changing clothing at this point would upset the continuity of the slide series.

We choreographed the posing top-side, using a table to represent Waldo's favorite coral ledge. Christy extended her arm up from under the table to play Waldo's part. However, nobody gave Waldo a copy of the script. When we arrived at the scene, he came out of a different hole in the coral, and Cathy couldn't maneuver him into position. Waldo — stuffed with expensive baitfish from our previous dives — decided not to cooperate and retreated into his lair. Jim half-heartedly took some dull shots of Waldo hiding back under the ledge.

Remembering how Doyce had touched the top of Waldo's head during our first dive, Cathy cautiously reached back under the ledge and touched Waldo. Waldo didn't react, so she touched him again and began petting his dorsal fin. He didn't seem to mind the attention, so Cathy reached her hand around his body and began to pull him gently out from under the ledge. His muscles were relaxed as Cathy pulled, but as soon as he had enough, she could feel his

muscles tighten and she let go. Half expecting Cathy to lose a hand at the elbow, Jim soon finished his roll of film.

THE FIFTH DIVE

At last — everything worked well! Waldo was cooperative, Jim was steadier and Christy wasn't laughing all the time. Cathy reached under the ledge, pulled Waldo out and cuddled him while Jim photographed them with a Nikonos 28mm lens and Ektachrome 64. Because working with Waldo was becoming easier, Jim didn't need depth of field to cover focusing errors and chose the slower, finer-grained film.

Waldo did scare Cathy a little when he smelled the fish stored in her BC. His eyesight is terrible, and he just followed his nose — almost into her BC pocket! Cathy didn't want to push his nose away with her fishy smelling hand, and the anxious pose showing her facemask pressed against Waldo's head made an interesting picture.

We were just finishing our shots when Waldo decided to leave and swam along a crevice. Cathy was swimming along beside him when a group of divers happened by and "discovered" the huge eel. They quickly pointed him out to us with excited motions accompanied by lots of frantic kicking and hurried swimming. It was as if a herd of egg-beaters had joined us. The sand and sediment rose and visibility plummeted. Cathy decided that if the newcomers wanted to see the eel, then they would see the eel. She went into the crevice, pulled Waldo out and thrust him into their midst. Well, that really got their fins going. One diver moved her first finger in a circular motion by her ear because she knew for certain that Cathy must be absolutely crazy. They departed in a cloud of sand and, again, Christy almost drowned laughing.

THE SIXTH DIVE

It was time for close-ups and our last chance to work with Waldo before heading for home. Jim decided to use a Nikonos with the 28mm lens and Nikon close-up lens because it was easier to handle than our housed Nikon F. The close-up lens has a support rod which holds the focal frame, and has a picture of approximately 6 x 9 inches when used with the 28mm lens. The objective was to place the framer over Waldo's head for a portrait.

Waldo was cooperative, and Jim had no trouble placing the framer over his head. However, the framer did get in the way as Jim worked with camera angles, so he took it off and aimed with the support rod alone. Then Cathy moved closer and closer to Waldo, until her faceplate was only inches away from Waldo's mouth. Jim placed the end of the support rod beneath their chins and got his picture. >>>

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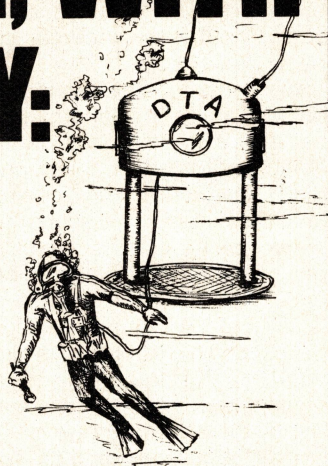
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FILM FESTIVALS

(Continued from Page 22)

interest to all underwater enthusiasts. You'll be able to meet the exhibitors, ask them questions and even get an autograph, if you wish. After the reception, the 1st Decompression Stop and Splash Party will start in the pool area on the 16th floor.

Saturday, at 9:00 am, a series of concurrent seminars will take place: The Sea and Its Occupants, The Diver and the Sub-Aquatic Environment, Dive the World, Phantoms of the Fathoms (Wrecks) and Underwater Photography. After a 12:00 o'clock break for lunch, the programs will be repeated.

A scholarship banquet attended by the six previous recipients of the Our World-Underwater Scholarship and the entire scholarship committee will be held at 5:00 pm, Saturday evening to announce the new winner. Separate tickets are available to this banquet at \$15 per person.

A film program will be held Saturday night from 8:00 pm to 10:30 pm, at the Medinah Temple Auditorium. The 2nd Decompression Stop Party follows at the Raddison.

On Sunday from 10:00 am and until 1:00 pm will be the original "How-To" workshops: How to collect, preserve, cook, restore, and photograph your favorites from the depths.

Package tickets for the weekend program, including the reception (two cocktails included), all seminars (Saturday and Sunday) and the film program are \$18, previous to April 1st, and \$21 thereafter. Individual tickets, purchased separately, are \$21, previous to April 1st, and \$27 thereafter. Special block (10) ticket prices are available to clubs and shops before April 1st.

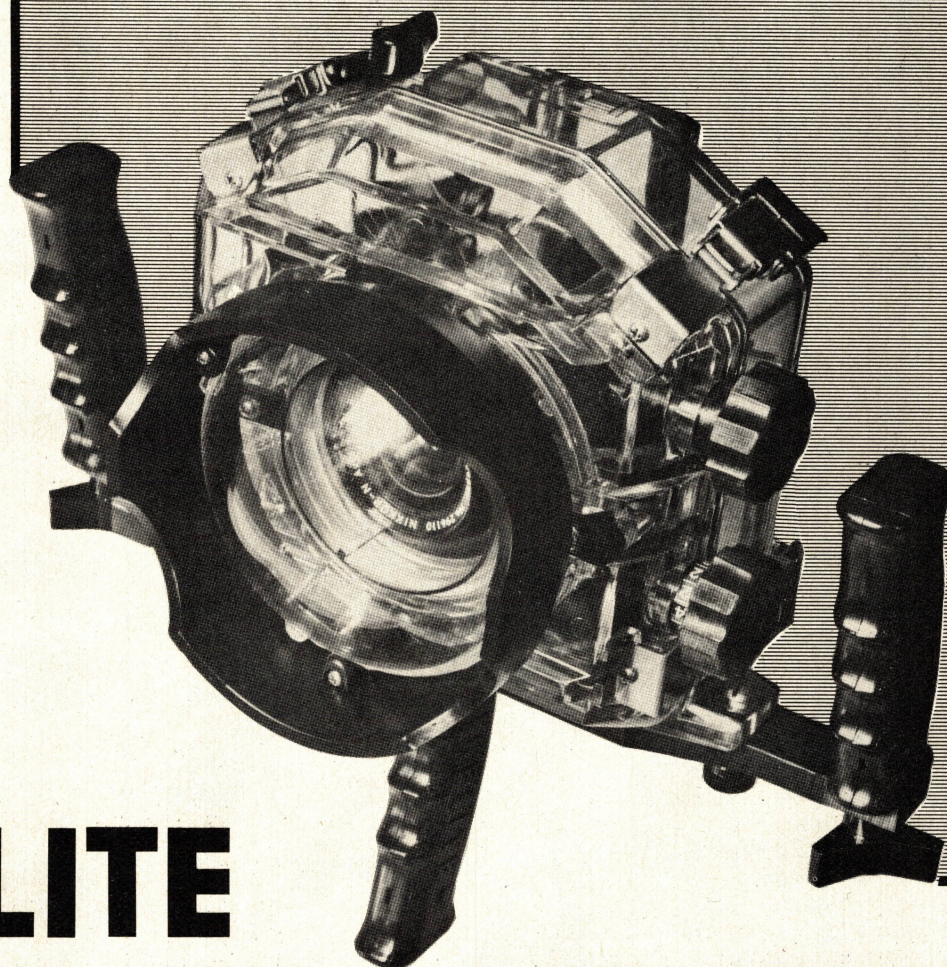
For information, write: Our World-Underwater IX (Tickets), P.O. Box 4428, Chicago, IL 60680.

AUSTRIAN PHOTO COMPETITION

Erich Proll of the Stadtmuseum Nordico in Linz, Austria, has announced the Second Annual Austrian U/W Film Festival and Photo Competition. Entry deadline for the competition is April 30, 1979. Prizes will be awarded on May 19th, at 7:00 pm, and a non-stop festival of slides and movies will follow on May 20th from 10:00 am until 7:00 pm at the Stadtmuseum Nordico in Linz.

General contest rules are as follows: An entry fee of 120 Austrian shillings, plus return postage (international reply forms) must accompany each entry. Slides and films which have been awarded prizes in previous contests will not be accepted. The Hans Hass medal

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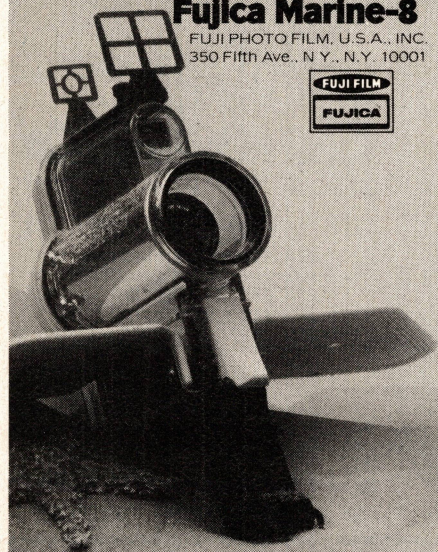
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FILM FESTIVALS

and other prizes will be awarded to winners in each category. All possible care will be exercised, but the organizing committee assumes no responsibility for loss or damage to entries.

Send entries to: Upper Austrian Diving Committee, Stadtmuseum Nordico, Bethlehemstrasse 7, A-4020 Linz, Austria.

SEA 79

Saturday, May 12, is the date for the Fifteenth Annual International Underwater Film Festival at the Paramount Theatre of the Arts, Oakland, California. Sponsored by the Northern California Chapter of the Underwater Photographic Society, this is the oldest underwater film



festival in the United States and draws exhibitors and entries from all over the world. A major attraction is the international photographic competition, with the award-winning prints and slides exhibited the night of the festival.

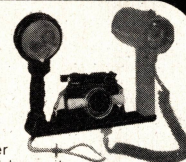
A San Francisco Bay Area classic, the UPS Film Festival has always led the field in new and innovative underwater photography with many major underwater movies making their debut. Paul Tzimoulis, editor-publisher of SKIN DIVER Magazine, will be the master of ceremonies for what is guaranteed to be an exciting evening of entertainment.

For further information and entry blanks for the competition, write: Underwater Photographic Society, % Rich Bergero, 22430 Thunderbird Place, Hayward, CA 94545.

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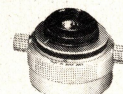
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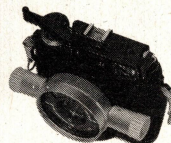
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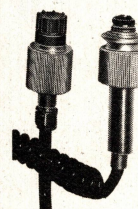
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photography by Frank Allen

Shipwreck

In Shipwrecks and Treasure (SDM May, 1978) we reported that the hostility of government archaeologists toward treasure hunters is so entrenched that federal bureaucrats are busily preparing new legislation designed to put them out of business. We also reported that the planned legislation, which would put shipwreck salvage and exploration under the control of the Office of Archaeology and Historical Preservation (OAHP) in the Department of the Interior, would entangle sport divers in a nightmare of bureaucratic regulations and restrictions.

My source of information was a tape-recorded talk by Mr. Charles M. McKinney, archaeologist and manager of the Federal Antiquities Program, who announced the plans at a Key West Conference on Historic Wreck Archaeology in November, 1977.

Mr. McKinney now claims that he was quoted "out of context" and that the legislation being prepared will not contain any language designed to regulate recreational sport diving. Mr. McKinney also charges that the sport diving community is without doubt used to further the cause of treasure hunters at which the new legislation is aimed.

Unfortunately, attempting to quote a federal bureaucrat "in context" would require several entire issues of SKIN DIVER. Also, experience has taught us that taking bureaucratic pronouncements as gospel to be accepted without question is foolishly naive and we are obligated to probe behind their gobbledegook and buzzwords in search of the facts as we see them.

An example of the need for such probing appears in a June 6, 1978, letter from OAHP to sport diver Edward Adamczyk explaining the proposed legislation:

"Dear Mr. Adamczyk:

"On behalf of Senator Richard Stone, we have been asked to respond to your inquiry of May 15, 1978. Your letter expressed concern that this Department is proposing legislative action to 'severely limit or ban wreck diving.'

"We are drafting a proposed amendment to the American Antiquities Act of 1906 (34 Stat. 225) that will grant to the Department of the Interior

authority over all prehistoric and historic properties on the federally controlled Outer Continental Shelf (OCS) except those properties under the jurisdiction of the Department of Commerce by authority of the Marine Protection, Research and Sanctuaries Act of 1972 . . .

"The Department's concern is in no way directed toward the recreational sport diver, but toward those treasure hunters who routinely destroy important scientific information in the process of gathering items of high market value from shipwreck sites. Our long term plan is to develop a comprehensive program that will make full use of the expertise of the scholarly community as well as that of the treasure salvor to maximize data retrieval . . .

"Be assured that we have no intention of limiting or banning recreational sport diving on shipwreck sites. Our proposed rulemaking on the definition of an 'object of antiquity,' and future amendments to the Abandoned Property Act (40 U.S.C. 310) and the American Antiquities Act, will not entail an imposing of Federal regulations on the sport diving community. However, a sport diver who engages in shipwreck pillage would be subject to the same criminal sanctions imposed on treasure hunter activities that destroy cultural resources."

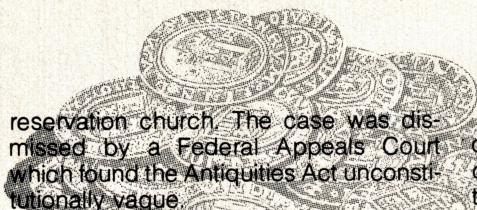
If the OAHP letter leaves you somewhat confused as to what is actually involved in Interior's proposed program but leads you to believe that sport divers have nothing to worry about, the bureaucrats have achieved their purpose. However, a review of the events and court actions leading up to the proposed legislative changes, and subsequent statements by Mr. Charles McKinney, give a different perspective.

First, Interior's record in protecting our cultural resources and national heritage under the Antiquities Act speaks for itself. The Act, passed in 1906, was intended to protect Indian artifacts and gave Interior authority to prevent removal of antiquities from public lands (primarily reservations). The first attempt to enforce the Act was in 1974 (68 years after after passage) when a man named Diaz was charged with stealing Indian relics from a

Legislation

A Nightmare for Treasure Divers

By Bill Barada



reservation church. The case was dismissed by a Federal Appeals Court which found the Antiquities Act unconstitutionally vague.

No attempt to amend the Act was initiated, however, until almost four years later; after Interior's claim to ownership of the Spanish treasure wreck *Atocha* was rebuffed by the Fifth Circuit Court of Appeals. Less than a month later Interior promulgated the proposed new regulations intended to broaden the Antiquities Act and extend Interior's authority to include artifacts found on the OCS. The word "artifact" is redefined to include "vessels" and "ships armaments."

The *Atocha* case was the first time either state or federal claims to ownership of treasure wrecks has been challenged in court and the rulings in both the Federal District Court and the Appeals Court threw a very big monkey wrench into Interior's plans for a takeover of shipwreck salvage on the OCS.

Despite OAHF assurances, the court's decision, followed by Interior's proposed plans to amend the offending federal laws, will have a tremendous impact on sport diving; perhaps greater than any other legal action that has yet been proposed. A brief review of the *Atocha* case is needed to set the stage.

Mel Fisher's group, Treasure Salvors, Inc., was working the *Atocha* under a lease/contract with the State of Florida, Division of Archives, which gave the state 25 percent of any treasure recovered. The Division of Archives retained all the treasure recovered from the *Atocha* and refused to divide it until the Supreme Court ruling on boundaries of the OCS put the *Atocha* beyond the state's jurisdiction.

Then, court records show, the Florida Division of Archives held onto its 25 percent of the *Atocha* treasure and urged the United States Government to move in and claim the entire treasure. The state agency also negotiated an antiquities permit with the federal government under which the treasure would be divided between the two agencies, federal and state, if the federal government won out.

Treasure Salvors challenged the federal government's claim to the *Atocha* treasure — and won. The Appeals Court ruling written by Judge Walter P. Gewin, tells the story in eloquent language.

Gewin stated, "This action evokes all the romance and danger of the buccaneering days in the West Indies. It is rooted in an ancient tragedy of imperial Spain, and embraces a modern tragedy as well. The case also presents the story of a triumph, a story in which the daring and determination of the colonial settlers are mirrored by contemporary treasure seekers."

He goes on to say, "For well over three centuries the wreck of the *Atocha* lay undisturbed beneath the wide shoal west of the Marquesas Keys . . . Then in 1971, after an arduous search [over six years] aided by survivors' accounts of the 1622 wrecks [in the archives], and an expenditure of more than \$2 million, plaintiffs located the *Atocha*. Plaintiffs have retrieved gold, silver, artifacts, and armament valued at \$6 million. Their costs have included four lives, among them the son and daughter-in-law of Melvin Fisher, plaintiff's president and leader of the expedition." [One of the salvor's vessels sank during the night, trapping its sleeping occupants. Lives lost were Dirk Fisher, Angel Curry Fisher, Nickie Littlehales and Rick Gage.]

The court ruling makes it clear that the OCS (on which the remains of the *Atocha* were found) is not "federally owned and controlled lands" and that shipwreck sites are not owned by the federal government under any other United States statute. It denied the government claim that the Abandoned Property Act gave the United States title to all treasure found by its citizens anywhere in the world as the sovereign prerogative of the American "crown" inherited from English common law.

The court ruled that ownership of shipwrecks, including the *Atocha* and other treasure ships, have consistently been adjudicated in Federal Courts under the maritime laws of salvage and the law of finds. Under salvage law, the claim of a finder of abandoned property is satisfied by proceeds from the sale of the property paid into court and can include the entire property. Under the law of finds, title to abandoned property vests in the person who reduces that property to his or her possession.

The court applied the law of finds to the case and awarded the entire vessel and its contents to Treasure Salvors. But Florida's Division of Archives refused to give up ownership of its 25 percent of the treasure, even after Treasure Salvors offered to donate it back to the state as a tax write-off. Federal marshals had to "arrest" the treasure and take it into custody; and the case went back to court.

The inventory of arrested treasure included 594 items marked "LIC," including an emerald, coins, barrel hoops and other material. When an archives spokesman explained this meant "Lost In Cleaning," a wag said it also could mean "Loot Intentionally Converted."

The District Court ruling, written by Federal Judge William O. Mehrtens, states, "As grave as the perils of sea are and were, the gravest perils to the treasure itself came not from the sea but from two unlikely sources. Agents of two gov-

ernments, Florida and the United States, who have the highest responsibility to protect rights and property of citizens, claimed the treasure as belonging to the United States and Florida."

He continued, "It would amaze and surprise most citizens of this country when their dream, at the greatest of costs, was realized, that agents of respective governments would, on the most flimsy of grounds, lay claim to the treasure."

The Court ruled that, "The coercive acts of the Division of Archives in threatening arrest and confiscation voids the contract under the general maritime law. [Specific court cases are cited.] Contracts entered into because of compulsion, or inequality of bargaining position may be set aside."

The transcript also states, "Chapter 267, Florida Statutes [the Antiquities Act], cannot be used to alter or prejudice the rights of a finder or salvage under applicable maritime law. For the state to insist that Chapter 267, Florida Statutes, governs the rights of a finder or salvager would lead to unconstitutionality of acts taken in such reliance."

The court goes on to say, "The application of Chapter 267, Florida Statutes, to wrecked and abandoned vessels is beyond the state's power as it is maritime in nature."

Thus, it appears that both federal and state antiquities laws are unconstitutional as applied to treasure wrecks or shipwrecks of any kind because they conflict with maritime law which has evolved over the years as a result of the concept of Freedom of the Seas.

Yet these are the laws that the archaeologists running the Department of the Interior's Federal Antiquities Program are hell bent on changing. At stake are highly delicate and explosive issues involving international agreements and treaties resulting from Conventions on the Continental Shelf under Law Of The Sea. As a result of one such agreement (involving drilling for offshore oil), Congress extended the Department of Commerce authority to include management of *natural* resources on the OCS. Interior's OAHF now plans to amend federal laws to include cultural resources (shipwrecks).

Thus, what we are actually witnessing is a bureaucratic power struggle between giant federal agencies over control of the vast resources on the OSC. The OAHF's all-out attack on treasure hunters as despoilers of our cultural resource appears to be a device by which Interior hopes to move into the OCS arena; and sport divers are pawns caught in the middle of this power play.

The significance of the proposed program to sport divers and marine salvors

as well as treasure hunters was made clear by Mr. McKinney in a speech to the Atlantis Rangers dive club at the University of Maryland on June 6, 1978. According to Mr. McKinney, the criteria to classify an article as an "object of antiquity" under the proposed regulation will include all man-made objects, including shipwrecks that are *50 years or more old*; and federally controlled lands will include the submerged lands on the OCS as well as uplands.

Since the number of shipwrecks off Florida alone is estimated at anywhere between 1200 and 4000 — and Bob Marx says his research shows at least 38,000 ships lost in the Western Hemisphere by the end of the 19th century — the magnitude of the proposed Antiquities program begins to come into focus.

Only a handful of these wrecks have actually been located. An example is the 17th century Spanish Treasure Fleet which was discovered off Vero Beach, Florida in 1960 and heralded as the greatest shipwreck treasure find in history. Eleven ships went down, but despite a continuous intensive search by expert treasure hunters, only two (possibly three) have been located.

Also, the 50 year-old criteria includes many ships that are still afloat today and "historical" information can be obtained from living ships. Thus, the sincerity of OAHF archaeologists is suspect and the proposed Antiquities Program begins to take on the all too familiar aspects of bureaucratic overkill.

Yet Mr. McKinney continues to talk of our "vanishing cultural resource" and suggests a program of cooperation and coordination combining the talents of the scholarly community, treasure salvors and sport divers in a long-term survey and inventory of shipwrecks to determine exactly what our resource base consists of. He states repeatedly, "We can't deal effectively with unknowns." Yet it is obvious that this is exactly what he and his fellow archaeologists in OAHF are trying to do. The underwater world is a complete mystery to Mr. McKinney and his fellow bureaucrats because they are not divers and have no practical field experience in marine archaeology. The antiquities program as described by government archaeologists is based on pure textbook theory and their ignorance of the real world is compounded by their refusal to learn from those with practical knowledge and experience.

This was made clear by Frank Allen who blasted McKinney's portrayal of treasure hunters as destructive vandals who have no interest in anything other than gold, silver and jewelry.

Frank Allen is a treasure hunter and president of the National Explorers and

Collectors Assoc., who has also been a historian and history teacher for more than 20 years. He has a Ph.D in history, a Master's Degree in supervision-administration, and several degrees in education. Allen got into treasure hunting because of his interest in history and numismatics (coin collecting). He was one of the people who, along with Kip Wagner, found old coins on the beach that were identified as from the 1715 Spanish Treasure Fleet. National Geographic sponsored his trip to the Archives in Seville to research information that eventually led to the location of two of the ships.

Allen gave up a highly successful and respected career and invested his time and money in full-time treasure hunting, for the same reasons that motivated most private collectors, antique dealers and other successful treasure hunters — the fascination of discovering and tracing down the meaning of articles that have lain buried for centuries beneath the sand and corals of the seabed.

Allen is not unique. The swashbuckling, hit-or-miss treasure hunter pictured by McKinney simply can't make it in the world of modern treasure hunting. The monetary investment in ships and equipment and the accumulated knowledge required are too great. As Jack Haskins, who gave up a career in engineering to go full-time treasure hunting, put it; gold bullion seldom brings more than two or three times its actual value and a knowledgeable treasure hunter is looking for rare objects because of their obvious value to collectors.

Frank Allen told the Atlantis Rangers that if it had not been for private enterprise and the treasure hunter's research in the archives, the cultural resource base and cultural heritage of our country based on shipwrecks would still be unrecognized because it would still be buried beneath the sand and coral of the sea floor. He said the knowledge of most marine archaeologists in the United States is limited to textbooks and classrooms, and the only practical underwater knowledge they now have was learned because treasure hunters taught them. (McKinney admitted that he has no underwater experience and is not even a scuba diver).

According to Frank Allen, if we wait for the federal government to make an inventory before they tell us which wreck sites we can touch, we will still be waiting 100 years from now. There is absolutely no need for the government to put a ban on everything in order to accomplish their objectives. All that is really needed, according to Allen, is a few representative ships, 40 to 50 at most as a cross section of the past 250 years, to provide all that is needed for a cultural resource base.

These 40 or 50 ships which can be selected from existing knowledge will offer everything we need to know about life in that era aboard a shipwreck.

Frank then asked, "Why does our government always have to be prohibitive, restrictive, controlling? Why in the world can't just one agency somewhere along the line be innovative?"

McKinney responded that Frank's opinions were the same as those of other treasure salvors he has known over the years and he had the feeling that Allen is beginning to believe some of the stuff he has been reading in dive publications.

McKinney's answers to sport divers' questions are equally revealing. When asked if 50 year-old wrecks protected under the program will be closed to diving, McKinney said, "Those determined *eligible* will be off-limits for study during that period; but if excess we plan to have certain wrecks eliminated from the process once they have been evaluated."

This is a typical bureaucratic approach: control everything until you are forced to give something up, then do it piecemeal. Can you visualize an army of government-paid archaeologists swarming over the sea floor in an attempt to "evaluate" the historical significance of every shipwreck known to, or discovered by, skin divers or treasure hunters?

Mr. McKinney's next answer made his theoretical approach to the program appear even more ridiculous.

Someone asked, "How will a sport diver know he is on a protected wreck?" McKinney's answer, "It will be published in the Federal Register." When it was pointed out that few divers ever see the Register, Mr. McKinney promised that he would personally see that the information is put out to the sport diving community.

Dive equipment manufacturers would like to know how this is to be accomplished. Nobody has yet figured out how to get even vital safety information out to all members of the diving community. Even if this were possible, it is difficult to imagine a bunch of wreck divers driving around with a list of "protected" wrecks in their gear bag — or how they would recognize such wrecks underwater.

As one member of the Atlantis Rangers stated, "Any sport diver who thinks this program won't affect our activities should have his head examined."

Mr. McKinney insists that most sport divers favor his program. If you wish to comment, the address is: Mr. Charles M. McKinney, Federal Antiquities Program, Office of Archaeology and Historic Preservation, Department of the Interior, Washington, D.C. 20240.

However, my guess is that comments will be more effective if made to your senator or congressman. »

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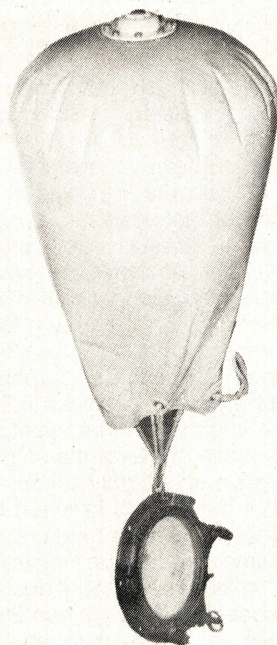
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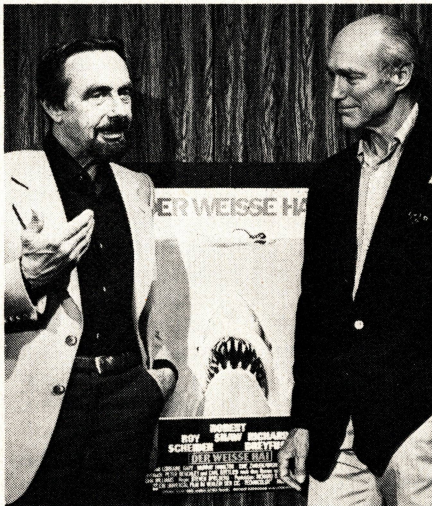
A highly informative series of seminars on U/W photography will be held in Los Angeles on four successive Tuesday evenings, May 8 through May 29, 1979. Sponsored by the Los Angeles County U/W Instructors Association, each seminar will be held at the L.A. County Health Services Building, 313 N. Figueroa off Temple St., from 7:30 pm until 10:00 pm. The series is open to the diving public and will be entertaining to non-divers as well.

A number of highly qualified, award-winning U/W photographers will discuss the basics as well as more advanced techniques. Creative slide shows and demonstrations will supplement each evening's material. Subjects to be covered include: May 8th: Housings and Cameras/Lenses; May 15th: Ambient Light/Artificial Light; May 22: Movies/Wide Angle Photography; May 29th: Accessories/Slide Shows.

Tickets are \$20 for the series. For tickets and information, contact: Ron Merker, 4535 W. Coast Highway, Newport Beach, CA 92663. Phone (714) 673-5440. Make checks payable to: L.A.C. U/W Instructors Assn. Free parking is available at the County Health Services Building.

WATERMAN ON GERMAN TV

Underwater photographer/explorer Stan Waterman appeared in a German television special recently. The one-hour



Hans Hass and Stan Waterman

documentary, produced by fellow U/W pioneer Hans Hass, consisted of selections of Stan's films from the early 1950's to the present. Hass narrated and personally presented the program for German, Austrian and Swiss audiences.



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YMCA CONVENTION

Divers holding any national scuba certification and their interested friends are invited to attend the National YMCA's 1979 Underwater Activities Convention in Key West, Florida, May 18-20. Research conducted all over the United States will be discussed and speakers will address a variety of subjects related



to diving. Dive equipment manufacturers/retailers/travel organizations will have products on display, and a film festival and party will be held Saturday night.

The YMCA 1979 Underwater Convention will be held at the Casa Marina Inn, located within minutes of the National YMCA Center for Underwater Activities. On Monday after the conference, the center will be open for free tours.

For information, contact: The National YMCA Center for Underwater Activities, P.O. Box 1547, Key West, FL 33040.

U/W MEDICINE PROGRAM

The 14th International Advanced Physicians Underwater Medicine Program has been scheduled for June 2-9, 1979, at the Holiday Inn, Key Largo, Florida.

The program will cover detailed aspects of dive medicine. The academic hours will focus on cardiovascular physiology as it is related to the diving environment. There will be an in-depth review of the theory underlying the decompression tables as well as problems encountered in mixed gas diving.

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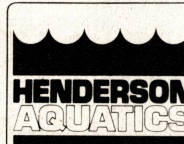
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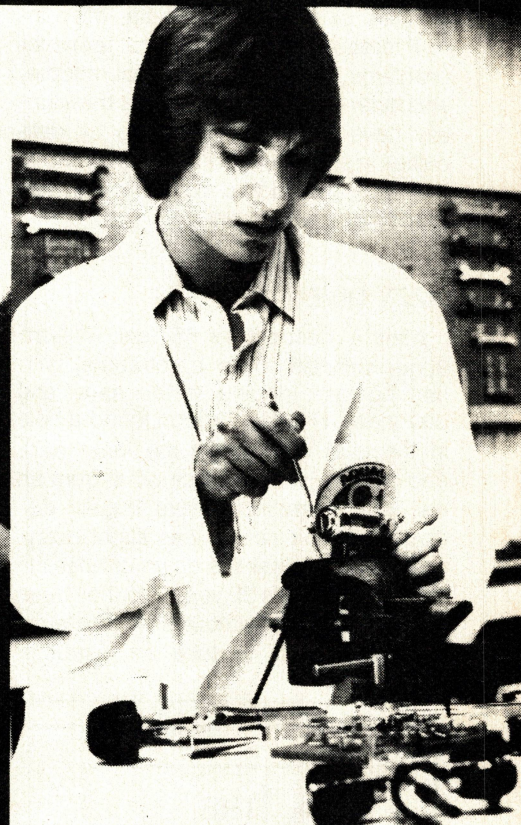
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Medifacts

BY CHARLES V. BROWN, M.D.

EAR AILMENTS

Otitis externa, otitis media, otitis interna — these are medical terms for problems involving the external, middle, and inner ear. Divers and pilots traditionally have been most plagued by difficulties in equalizing pressure differences between the middle ear and the surrounding environment.

DIZZY DIVER

After a descent to 65 feet, William Burke suffered otitic barotrauma, with hearing loss, ringing in the ears, and dizziness. His ear surgeon found a hole in the oval window (of the inner ear), and sealed it with a piece of fat from an ear lobe. Symptoms have largely disappeared, but he still has slight dizziness when he first lies down or arises in the morning. He's 32 years old, has been diving 22 years without any problems, and now wants to take an instructor

training course. His own doctor recommends he give up diving.

Answer: There are two considerations: 1) Will recurrent window rupture be likely? Probably not, if you know the cause of the accident and are careful to avoid it. Our guess is that you had a eustachian tube block, and either descended without enough attention to equalizing, or else performed an over-zealous Valsalva maneuver. 2) Will you get dizzy in the water? Some people who suffer inner ear damage and seem to recover completely find that dizziness does return in the water. In our view, even mild dizziness would make diving unsafe, for under certain conditions (reduced visibility, surge, pressure or temperature change in the middle ear, etc.) it could escalate to full vertigo.

Don't sign up for that course till you've checked yourself out thoroughly. Start in a pool, shallow end first, and try a mask with the face plate blacked out. Be certain to have positive control of your buoyancy, and an informed buddy with his eyes glued on you.

SWIMMER'S EAR

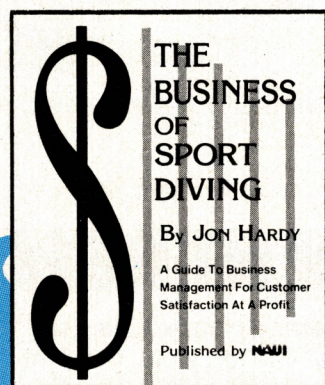
Greg Babiak of Port Vue, Penn., is very susceptible to swimmer's ear. To prevent it, he uses a product called Swim-Ear (boric acid plus isopropyl alcohol). Al-

though the label would have him put some into each ear after leaving the water, he does so just before entry, and gets complete protection. He would like our comments on this practice.

Answer: Otitis externa, or infection of the external ear canal, is commonly called swimmer's ear because it so often follows prolonged exposure to water. The skin lining the canal normally harbors harmless bacteria, designated as gram positive because of their staining characteristics in the laboratory. When wet, the skin's protective waxy coating softens, the skin itself softens, and the level of acidity falls. This moist, alkaline environment is ideal for harmful gram negative bacteria, which thrive and cause infection. To prevent such nastiness, ear specialists have long prescribed a combination of a drying agent, usually alcohol, with a mild acid. Swim-Ear is such a preparation. Instilling it either before or after a dive usually works, but for maximum protection, do both.

BAD NEWS

While free diving last summer, David L. Drennan of Garberville, Calif., ruptured his right ear drum. The cause: improper equalization. An ENT specialist found a thin spot on his ear drum, possibly the result of childhood ear infections. The



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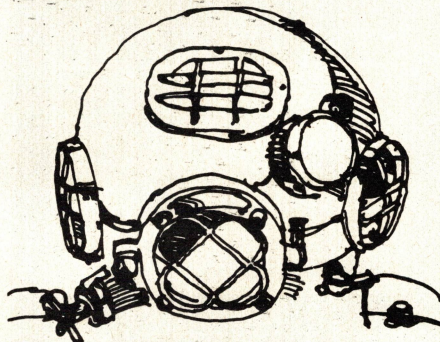
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specialist said that if David continues to dive, he runs a 25 percent chance of permanent ear damage. An avid diver since 1956, David is not pleased with this news. Is there an external ear device that can assist in equalizing pressure?

Answer: There's no way that any external device can equalize middle ear pressure. Such equalization can occur only via the eustachian tube. Your letter made it clear that you had poor eustachian function in childhood, and still do. The 25 percent risk of permanent damage if you dive is only an educated guess; there's no way to be sure. It could be more or less. That weak spot on your ear drum could be strengthened by a graft, but that would improve your risk only a little. The real solution lies in correcting the eustachian insufficiency. If your ENT specialist cannot find a way to do this, you're better off not diving.

ALTERNOBARIC VERTIGO

Jay Rollnick of Miami has been diving for 32 years. Last year following some deep dives, he developed difficulty equalizing his ears when descending. This was relieved by an operation to straighten out the middle partition of his nose. Now he has developed a new problem. During the final 20-25 feet of ascent with scuba (regardless of prior depth) he gets vertigo. It stops if he promptly descends a little, and recurs with ascent. His ears feel blocked and there are some whistling sounds. After 30 to 60 seconds on the surface he's OK. What causes the trouble and what can he do about it?

Answer: Mr. Rollnick has presented an excellent description of alternobaric (change of pressure) vertigo. The eustachian tubes do not open as readily as they should during ascent, so there is over-pressure in the middle ears. This somehow stimulates the vestibular apparatus — the sensors in the inner ear that are supposed to sense only rotation. If the false messages flashed over the right and left vestibular nerves are of equal intensity, they cancel each other and the brain is not fooled. In alternobaric vertigo, eustachian function and therefore middle ear over-pressure is unequal, or else one vestibular apparatus is less sensitive than the other. Such reduced sensitivity results from damage — in this case perhaps from the difficulty in equalizing during descent prior to the operation. Anyway, the vestibular nerves carry unequal messages, and the brain

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What can be done? The problem could be cold sensitivity — the nose congesting during a dive. So you can try wearing a wetsuit with a hood that keeps both body and head warm. A decongestant tablet or long acting nose spray such as Afrin might help. Ascent should be very slow, preferably on an anchor line, with frequent swallowing along the way. If the problem persists, a specialist can order tests to help pinpoint the cause, and help you decide whether it's safe to dive.

MASTOID OPERATION

In 1957, Robert De Ruff had a modified radical mastoid operation and subsequently suffered from nausea due to water circulating in his enlarged ear canal. A doctor suggested that he use a plug of lamb's wool, held in place with Vaseline, to slow down the water circulation. De Ruff has used this method successfully for over 20 years.

Answer: Sinuses are lined with cells that make mucus. The maxillary, frontal, ethmoid, and sphenoid sinuses drain directly into the nose and throat; but the mastoid sinuses drain into the middle ear. From there, the mucus passes down the eustachian tube to reach the throat. Prolonged blockage of the eustachian tube leads to chronic mastoid disease, along with middle and inner ear damage.

Modern medical techniques have made chronic mastoiditis rare, but some middle aged divers will remember it as a serious affliction of their younger days. Treatment was surgical, and the surgeon would often enlarge the external ear canal to gain access. The oversized canal meant nothing to a person pursuing an ordinary, topside life. No one foresaw the difference diving would make.

The enlarged canal holds more cold water, and allows it to circulate more freely. The air in the middle ear becomes chilled and in turn cools the adjacent portion of the inner ear. This creates a convection current within one of the semi-circular canals, and a false message of motion is flashed to the brain. The result: dizziness and nausea. We thank Mr. De Ruff for sharing his solution.

AUTO-INFLATION

Kent Pafford, age 13, of Gallatin, Tennessee, plans to start scuba diving. He needs to know whether the stuffy nose he's had lately will prevent clearing his ears and sinuses. Andy Way of Fort Worth, Texas, couldn't clear his ears at 13 feet when diving for an advanced cer-

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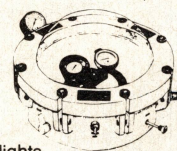
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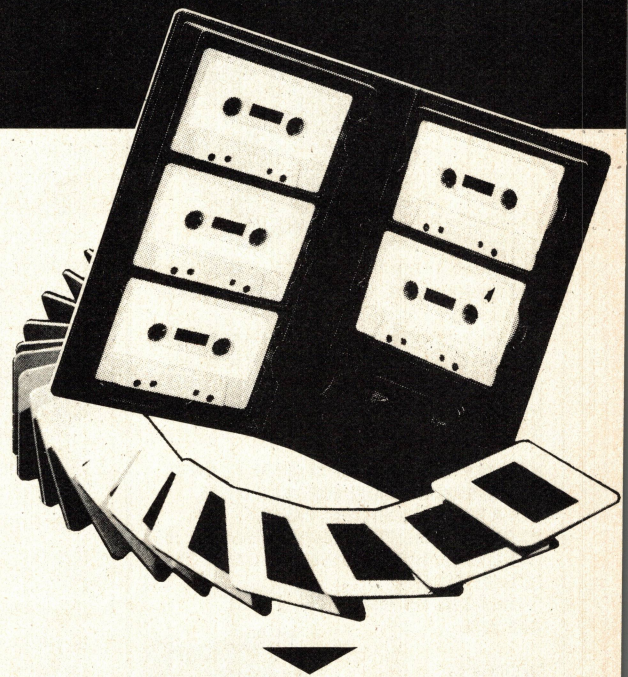


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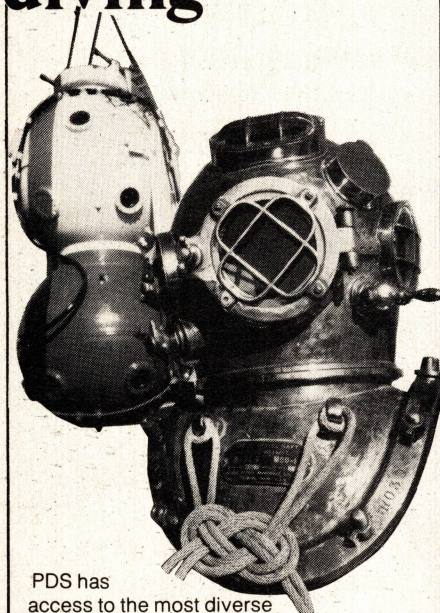
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tificate, even though he'd used a lot of Ear-Eze. Later, in a fun dive, he dropped to 35 feet with no problem. Why the difference? Could it have been nervousness, or cold water?

Answer: Noses are funny things. Stuffiness does hint there'll be problems with ear and sinus clearing, but it's not a very reliable clue. That's because the amount of swelling is less important than its location. The sensation of stuffiness is caused by swelling that blocks easy air flow through the nostrils. But a eustachian tube will get blocked only if there is swelling inside it, or about its opening into the nasopharynx (back where the nose joins the throat). Sinus openings are in various locations, and may or may not be blocked when the nose is stuffy.

Although we can't tell the diver with a stuffy nose whether he'll have a problem, we can suggest ways for him to tell. One way is to drop to the bottom of a swimming pool without scuba. If he can't clear readily, he won't be able to with scuba either. Another way is to try to inflate the middle ear without getting into the water.

During a dive, the middle ear must equalize with ambient pressure either passively or actively. In the former, the diver may swallow or move his jaw about to help open the eustachian tube, but he does nothing to force air through it. In the latter, he does. It's called auto-inflation (do-it-yourself inflation). The auto-inflating maneuvers that will work during a dive should also work during a dry run topside. There are two: the Valsalva and the Frenzel. Both require blocking off the nose and mouth so air can't escape; they differ in how to compress the air. In the Valsalva, you simply blow. As explained in previous columns, this method can be risky. In the Frenzel, you don't blow. Instead, you close your larynx, tense your mouth and throat muscles, and then drive your tongue upward or backward. This method is safer and more effective, but it can be tricky to learn. The major hang-up seems to be in closing the larynx. It's really easy — it's what you always do just before a cough comes out. The trick is to hold it closed during the clearing maneuver. With successful auto-inflation, you'll feel the air bulging your eardrums a little.

The ability to auto-inflate topside suggests you'll be able to do it underwater too, but it's not a guarantee. Too many variables enter in, and some of them may explain the inconsistency that Andy encountered.

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We stumbled down the winding road in semi-darkness—excitement mixed with anxiety over the prospect of what was to be our first night dive. As the sky slowly changed from crimson to royal blue, we finished our dive preparations and began inching our way over the slimy rocks and into the cool, jet-black waters of Malaga Cove (a normally quiet cove tucked into a corner of the Palos Verdes Peninsula in Southern California).

As my eyes adjusted to the darkness, I began to see sparkles—at first dimly, then gradually a little brighter—appearing almost everywhere, darting about like aquatic fireflies agitated by any movement underwater. Truly amazing! But suddenly my interest shifted. Except for these sparkles, I couldn't see anything else in this pitch-black ink. What dangers might the surrounding darkness hide? What creatures could be lurking in the shadows?

Many types of fish feed at night (including sharks), lobsters feed at night, why, even abalone feed at night. Good grief! Quickly I turned on my dive light. A beam shot out, piercing the darkness. How comforting that was. First, I found my buddy (fortunately nearby). He was still entranced by the "sparkles" but not for long: My light shattered his night vision. (Note:

Cardinal rule of night diving: "Never shine your light in your buddy's eyes!")

Looking around, I could see some of the familiar features of the cove: the rocky bottom, the thick covering of eel grass, even some of the fish I'd seen on day dives. But this experience was different. First, my attention was confined to the small portion of the underwater world illuminated by my light (that is, after I assured myself, with a quick scan of the area, that no threatening animals were lurking nearby). Second, I was seeing for the first time fish and other creatures I hadn't seen during the daylight hours. And third, for the first time I was seeing this underwater world in its true colors—the deep purples and maroons of the sea urchins, the vibrant oranges of the garibaldis, the brilliant reds, yellows, and greens of anemones—exciting colors, which had previously gone unnoticed, because they were absorbed by the water. But now they were exposed merely by getting close with the dive light. What a turn-on!

This experience, a few years ago, was my first introduction to night diving and to that extremely useful piece of dive gear—the dive light. Although most divers tend to associate the light with night diving, it has found increased use in other aspects of diving: for observation during the day, to bring out

those "lost" colors so often missed; for looking into crevices and under ledges when taking game (ever ask yourself if that hole contained a moray as well as a lobster?); for illuminating the dark compartments of a wreck, or the black chambers of a cave; for use as a "spotting" light in U/W photography, or simply to light up the subject as an aid in focusing; not to mention the many uses for any type of rugged, waterproof light around your camp, car, recreation vehicle, or boat. The dive light is indeed a versatile tool.

SELECTION

The dive light seems, at first, to be a very simple piece of equipment. Indeed, many divers walk into a dive shop and ask for the brightest light available—as if there were nothing else to consider. But there's much more to the selection of a dive light than just "brightness." If you are thinking about buying one, you may wish to consider some of the following factors: application, price, light output, bulb lifetime, batteries, buoyancy, size and shape, and service.

1. APPLICATION—how you intend to use your light. This should be one of your first considerations. Think about all of your possible uses, then list them (in your mind, or on paper). This list, together with the other factors (to follow), should narrow your possible choices to just a couple of lights.

2. PRICE—another big factor in dive light selection. The suggested retail prices for lights in this survey range from \$9.95 to \$550, with features and light outputs to match their respective prices. Generally speaking, rechargeable dive lights are more expensive than disposable battery models. To keep the prices from becoming too bewildering, a good suggestion for the prospective buyer is to set a maximum limit on spending, then look only at lights that are priced within that limit. This is often easier to say, than do. There is always the temptation to spend a little more money for another feature or do-dad, then a little more for... and so on. When comparing prices, be aware that rechargeable dive lights include the battery and a charger, while lights with disposable batteries generally do not. If, for economic reasons, you plan to buy a disposable battery light, be sure to include the cost of the battery (or batteries) in your budget.

IN THE DARK ABOUT DIVE LIGHTS?

PART I: How To Select An U/W Light To Suit Your Particular Needs
By George Cozens

Virginia dive shop owner Bill McGehee illuminates the waters off San Salvador Island, in the Bahamas, with an experimental, high-powered underwater light.

photography by Paul Tzimoulis

If you want to economize now, but think you'd like to get a more powerful light later, you might consider going one of two ways: Buy a smaller, less expensive light for your immediate needs (this could be used later as a back-up or emergency light). Or get one of the "modular" lights — you can buy one of the less expensive models now, then improve the light for future use by simply substituting a more expensive and more powerful battery pack (and bulb, in some cases) since the housings are identical. A few of the lights by Dacor, Ikelite, and Oceanic/Farallon offer this "modular" feature.

DIVE LIGHTS

3. **LIGHT OUTPUT** — should be considered in terms of both light *brightness* and *angle*. If light from a lamp is concentrated into a very narrow beam (similar to a laser beam), the brightness can be greatly increased. But it won't be very useful, because the light beam will illuminate only a very tiny viewing area. If the beam from this same lamp is spread out (i.e. the beam angle is enlarged) to illuminate a bigger viewing area, the light will be more useful. But it won't be as bright. This relationship between light brightness and light angle is important. Taken separately, neither one adequately describes the output of a dive light. For example: a million candlepower dive light (a laser, perhaps) is not necessarily good if the beam is too narrow to be useful.

How wide the light beam should be depends upon your own application: A fairly narrow beam might be good as a spotting (aiming) light in photography; a moderately wide beam could be used for general U/W observation; and a very wide beam as the main light source in U/W photography (especially movies), or for illuminating large areas.

How bright a light should be also depends upon your application. Obviously, it should be bright enough to meet your needs (for seeing, for photography, etc.) but the quest for extreme brightness can be expensive in terms of dollars and inconvenience. Very bright lights usually require more powerful battery packs: either more expensive, high capacity batteries, or a greater number of ordinary batteries — which increase the cost of the light as well as its weight, size and drag.

Less powerful battery packs will be



drained more rapidly by brighter lamps, so that operating times will be less (i.e. shorter dives), and battery recharging or replacement more frequent. One trick-of-the-trade to achieve brightness without high battery drain is to "overvolt" an ordinary lamp (i.e. to operate it at a voltage higher than it was designed to take). A large increase in brightness is gained by this method, but at the cost of a drastic loss in the lifetime of the bulb.

4. **BULB LIFETIME** — is the number of hours a bulb can produce useful light. Typical lifetimes for bulbs found in this survey, under laboratory (ideal) conditions, range from 25 to several hundred hours. However, in actual use, bulb lifetimes are somewhat less. Already mentioned, is the practice of "overvolting" a lamp, which greatly reduces a bulb's lifetime. This practice is not necessarily bad, if it produces the desired brightness and still leaves the bulb with an acceptable lifetime. Improper handling takes its toll on a bulb's life, also. The bulb's filament is probably the most fragile part of a dive light. Physical shock — caused by dropping, throwing, or banging against objects — or vibrations from the car or boat while in transit can be deadly to the bulb.

Over the lifetime of a conventional bulb, the filament material gradually vaporizes, and deposits a black coating on the inside of the glass envelope. As this coating builds up, the light output diminishes slowly. Halogen bulbs contain a halogen gas inside, which prevents or at least reduces this black deposit from accumulating. The result is that halogen bulbs have a much more constant light output.

The effect of shorter bulb lifetimes, and of excessive blackening in the bulbs, is more frequent bulb replacement. This increases the operating cost of the light, as well as the additional inconvenience of having to carry several spares, of making the bulb changes more often, and of possible interruptions in your dive schedule.

5. **BATTERIES** — the power supply of the dive light. This is one of the most important considerations in dive light selection, because of its impact on the light's cost and practical uses. There are two simple categories of batteries: disposables, which consume their active chemicals during operation; and rechargeables, whose energy producing chemical reaction can be completely reversed by "recharging." The following points of comparison might be helpful in deciding which type of battery-powered light to buy:

a. **ECONOMY.** The typical argument goes, "Rechargeables are more expensive to buy, but will save you money in the long run." This is true if your light is used reasonably often. But if operated only infrequently, the disposable battery light may be more economical. It is less expensive to buy; and, when used intermittently, its performance improves because the disposable recovers some of its "strength" while resting between uses.

b. **BRIGHTNESS.** Because of their high power demands, very bright lamps generally require rechargeable batteries. These batteries have greater capacity, and can deliver higher currents than disposables. If extreme light brightness over a wide angle is not required in your diving, then either type of

battery might do well.

c. **LIGHT DURATION.** How long a dive light produces usable light is a function of the battery-bulb combination. Some manufacturers offer optional light bulbs with different light intensities and durations. Typically, the brighter the light, the shorter its light duration. This light duration can have a major effect on your diving plans. A brief look at the light test results (in Part Two of this survey) indicates that most of the rechargeable lights have light durations of about one to two hours. This time is more than adequate for single dives. But if you plan to use your light on repetitive dives (e.g. a couple of night or wreck dives taken within a few hours of each other) then you may want to consider interchangeable, rechargeable battery packs for your rechargeable light, or just use a disposable battery powered light with a reasonably long light duration.

d. **COLOR.** The color of light is not generally important in diving, except when the dive light is used in underwater photography. In photography, the film should be matched to the color of the light source. This source should provide bright light at a constant color — which means the battery needs to provide the lamp with adequate power at a nearly constant voltage (color is related to lamp voltage). Nickel-cadmium and some types of "gel cell" rechargeables are about the only batteries that satisfy this requirement. If not drained too rapidly, ni-cads and gel cells maintain relatively constant voltages during discharge with a sudden drop at the end. Sealed-lead-acid (SLA), other gel cell rechargeables, and all disposable batteries exhibit a gradual drop in voltage (and thus a yellowing of the light) during use.

e. **CHARGING POWER.** Availability of electrical power for recharging batteries can be another consideration, especially if you plan to use the light on extended trips to remote dive spots. Most of the charging units require 110 volts, A.C. (available almost everywhere), but many can be powered by 240 volts, A.C. (available in Europe), or by 12 volts, D.C. (available on most cars, boats, or recreation vehicles).

Larger commercial dive boats often have a generator aboard which provides 110 volts, A.C. But outlets may be inconvenient and/or crowded, so it is a good idea to take along an electrical extension cord with multiple sockets for recharging operations. On smaller boats or on dive trips with your car or R/V, 12 volt, D.C. charges can work well. But be warned, these units are designed to plug into cigarette lighter sockets. If a 240 volt, A.C. charger is not available, and you plan to travel abroad, consider using the regular 110 volt, A.C. charger and a 240 to 110 voltage converter (found at most

larger department stores). If no electrical power is available, your only solution may be to carry extra rechargeable battery packs (fully charged), or to use disposable batteries.

f. **CHARGING TIME.** For the rechargeable lights in this survey, charging times vary from 8 to 20 hours for full recharge. Shorter charging times will give proportionately shorter light durations. If additional battery packs are not available, or if the batteries are not removable, the light will be out of operation during the recharging period. This is another factor to consider with regard to your diving plans.

g. **SHELF LIFE.** If your dive light will be stored for extended periods, the shelf life of the batteries may be a consideration. Disposables have fairly good shelf life but should not be left in any appliance for very long without use. In time, they may leak and cause damage. If long term storage is planned, disposables should be removed from the lights. Some suggest that storing under refrigeration reduces battery deterioration. However, if chilled, the battery should warm up to room temperature before use. Rechargeables also exhibit good shelf life, but only if left in a charged condition. Storing in a discharged state or allowing the battery to discharge itself too deeply in prolonged storage can result in damage, especially for the sealed-lead-acid and some gel cell rechargeables. For this reason, most manufacturers recommend recharging soon after use, and then recharging at periodic intervals of from one to six months if not used.

So far, the three basic types of disposable batteries (standard carbon-zinc, heavy-duty carbon-zinc, and alkaline) have been lumped together. Standard carbon-zinc batteries are the cheapest, but provide the least service. Heavy-duty carbon-zincs are a little more expensive, but their better service may be worth the extra cost. Alkalines, the most expensive, can outperform the standard carbon-zincs in practically all respects, giving 2 to 10 times greater service under varying conditions. But alkalines are not recommended in all applications. Some lamps (e.g. General Electric #500) were not designed to take the quick surge of power that alkalines (and rechargeables) can provide. Manufacturers (Darrell-Allen, and Serl) who use this bulb suggest heavy-duty carbon-zincs for normal operation. However, for improved performance, Serl states that eight or nine alkalines can be used in their 10 cell battery pack, as long as one or two of the remaining "D" cells are carbon-zinc (which limit the initial power surge).

The three basic types of rechargeable batteries have already been mentioned: nickel-cadmium (ni-cads); gel cell (a lead acid battery, also called a solid gel cell, because the electrolyte is

a gelatinous/semi-solid composition of sulfuric acid); and sealed-lead-acid cells, or SLA (a lead-acid battery containing sulfuric acid electrolyte in more liquid form). Some comparison has already been made between these three types, but one point is worth reviewing. None of the rechargeables should be discharged deeply. If the light turns a yellow-orange in color, the battery is getting very low, the light should be turned off, and the battery should be recharged as soon as possible. To prevent accidental discharge, (e.g. turning the light on while traveling) the switch should be secured in the "off" position (by tape, etc.), or the wires to the battery disconnected and insulated to prevent shorting.

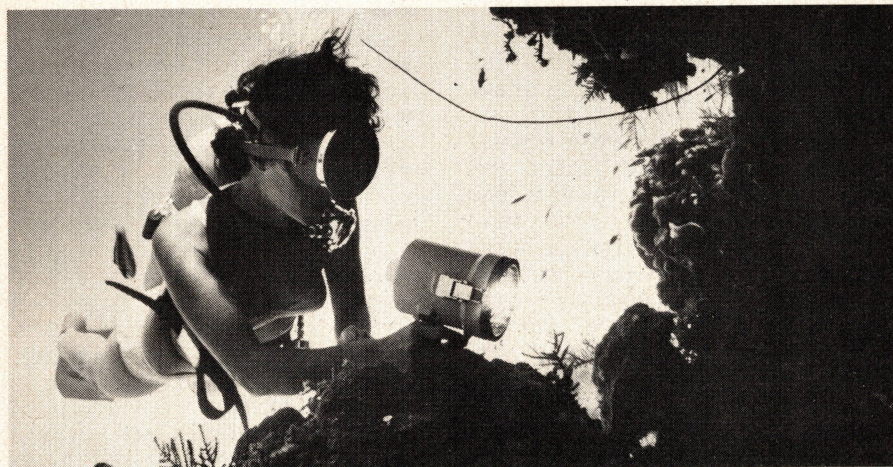
Overcharging batteries should also be avoided. Like deep discharging, overcharging can cause battery damage and reduced lifetime. To prevent overcharging, batteries should only be connected to their own charging units and should be charged only as long as the manufacturer recommends. In some cases (especially with gel cells and SLA's), charging the battery for an extended time can result in permanent battery and/or charger damage.

Ni-cads exhibit an interesting characteristic, called "memory" or "cell conditioning." If the battery is subjected to a series of partial discharge/recharge cycles, it may appear to lose some of its capacity by limiting its performance to what was delivered in the previous cycles. This memory effect can be erased by completely discharging, then fully charging the battery one or two times. Another curious, but welcome characteristic of ni-cads is that they appear to improve with use. Because of this, the lights which use ni-cads may perform even better after additional usage than they did in our survey tests.

To the economy-conscious or do-it-yourself diver, the idea of converting a dive light from disposable to rechargeable batteries, on your own at reduced cost, is an interesting possibility. General Electric markets a "consumer" rechargeable battery system, called Perma-Cell, which consists of two different chargers, and ni-cads in "AA," "C," and "D" cell sizes. Available at most department stores, these batteries can be used in lights having the same size disposables, as long as the bulbs are compatible. However, do not expect the same performance as similar dive lights with the manufacturer's rechargeable battery pack. The Perma-Cells just don't have the capacity of ni-cads that are available to the manufacturers. But they may be an improvement, at least in economy, over the corresponding disposable batteries.

Elpower makes a 6 volt rechargeable gel cell and charger that can be used in lantern battery powered lights (again,

DIVE LIGHTS



if the bulb is compatible). These batteries (#EP640A-21 for spring type terminals, or #EP640A-16 for spade type) and their respective chargers should be available to the consumer soon. If unable to find them at department stores or electrical supply houses, contact the manufacturer directly: Elpower Corp., 2117 S. Anne Street, Santa Ana, California 92704.

One additional word of caution: As with any do-it-yourself project, don't get in over your head. A simple reverse in the wiring can damage the battery and/or the charger.

6. BUOYANCY — another dive light consideration that depends on your own application. The lights in this survey weigh from a few ounces to about 12 pounds out of water, and are from 1.4 pounds negative to 1.4 pounds positive in salt water. Many divers prefer lights to be close to neutral buoyancy. If the light is too negative or too positive, it can be tiring to carry around. Some divers prefer slightly positive buoyancy so that the light will float to the surface if released — perhaps serving as a safety marker if needed. (Some lights float beam up for easier spotting.) Other divers prefer slightly negative buoyancy so the light will remain on the bottom when placed there (allowing the diver to use both hands to capture the lobster mesmerized by the bright light).

Fortunately, some manufacturers provide removable ballast so divers can adjust the buoyancy of their own lights. If ballast is not provided with your light and you feel it is too buoyant for your needs, try adding a small piece of lead (or other dense metal) somewhere inside the light housing to make it more

negative. But be sure to secure your ballast to prevent it from causing any electrical shorts or bouncing around and breaking something inside.

7. SIZE AND SHAPE — If you want a very bright light that covers a wide angle, then you'll need a powerful dive light — perhaps a fairly heavy and relatively large one. But for a number of applications, a smaller and somewhat less powerful light may offer you more versatility: Attach it to an U/W strobe to serve as a spotting light; strap to an arm or leg for use as a back-up or emergency light; or carry it as simple "handy" light, ready for use on any dive. How the light fits in your gloved hand is worth considering, too. Is it easy to hold, or awkward and hard to grip? Can the switch be operated while wearing gloves? With one or two hands? Does the shape allow you to mount it to a strobe, camera, arm, etc., if desired?

8. SERVICE — probably of little concern when buying a dive light, but of vital importance if you have to give up night, wreck or cave diving while your light is undergoing surgery and lengthy convalescence on someone's repair bench. Before buying your light, or while window shopping (hopefully at a reputable dive store), ask the sales or service personnel about servicing the light. Can the dive store service the light locally, or must it be returned to the manufacturer for repairs? Can service be provided within a reasonable time? Poor or delayed service can be very disturbing, especially when you're anxious to get back into the water with your light. Also, ask about the store's, and its customers' responses to the light. Are the owners satisfied with their

lights? Have many been returned or exchanged due to malfunctions? Listen for praises as well as complaints.

CARE AND FEEDING

Proper maintenance of your dive light is important if you want to ensure its satisfactory operation. If you have to depend on your light for a safe dive, be certain it is in good working condition before the dive: Check the bulb for darkening — a sign that it should be replaced; check the color of the light — if approaching a yellow-orange color, the batteries should be recharged or replaced. If fresh batteries have just been installed, turn the light on and let it "burn" for a few minutes to make sure that the batteries are all okay. (On one of my early night dives, my new dive light dimmed, and went out after just a few minutes. I found out later that one of the new D cells was bad and made the whole light fail.)

Carry an "emergency" back-up light to use if the primary light fails. Have a spare parts kit handy with extra bulbs, batteries, O-rings, O-ring lubricant, screws, connectors, fine sandpaper, alcohol (not the drinking kind, or you'll be tempted), and some simple tools for making minor repairs at the dive site. If extra bulbs are not readily available from the dealer or manufacturer, they may be obtained from commercial, electrical supply houses and/or auto parts stores.

Careful handling will increase your light's lifetime, as well as the bulb's. Protect the bulb's fragile filament from physical shock and vibration by wrapping it in towels, clothes, blankets, or wetsuit while in transit to dive site and by not dropping or throwing your light.

Battery lifetime and performance can be improved by protecting it from excessive heat. Don't leave it out in the hot sun or in the hot trunk of a car. Extend the life of disposable batteries in dive lights by using a regular flashlight for ordinary, topside chores. After use, especially in salt water, rinse the light with fresh water and dry, out of direct sunlight. When you open the light's housing, make sure you are dry enough not to drop water inside. Inspect the O-rings or gaskets and sealing surfaces for any nicks, dirt, wear, or other deterioration. Replace the O-rings or gaskets if needed. Clean the contacts on batteries and bulbs with fine sandpaper to reduce electrical resistance.

If the reflector and bulb are separate, be careful not to touch the reflector surface as it will tarnish very easily. Also, avoid touching quartz halogen bulbs with your bare fingers, since this may greatly shorten the bulb's lifetime. When reassembling the light, be certain that the components line up properly and any wires are out of the way before closing. If it doesn't want to go together, don't force it. Instead, check for the

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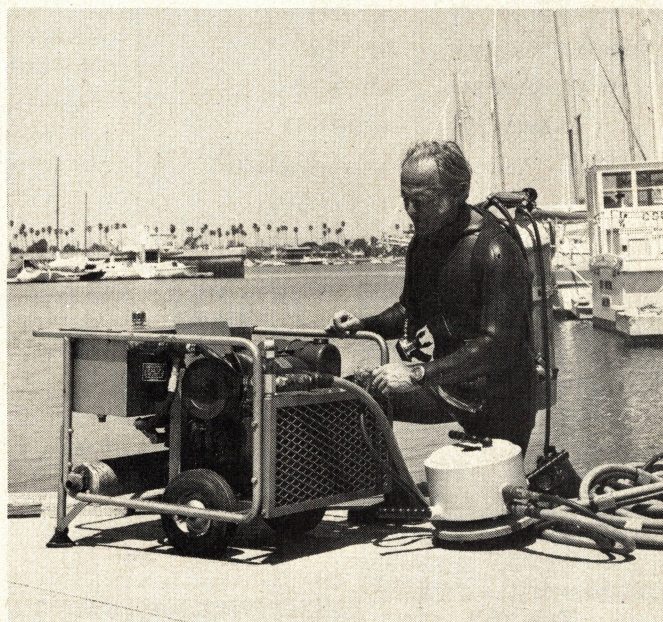
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IN THE DARK?

cause and correct it. O-rings or gaskets and all sealing surfaces should be clean. A light coating of silicone lubricant or vaseline on the O-ring can improve the seal and lengthen its life. Once the light is closed, check the O-ring, if visible, to ensure that it is making a good seal over all its length. Transparent housings are helpful here and in inspecting for leaks, battery condition, and condensation.

If, by chance, your light does flood, turn it off immediately and drain out the water as soon as possible. If flooded with salt water, rinse the light interior, including bulb and batteries with fresh water (distilled water is even better), then with 50 percent fresh (or distilled) water and 50 percent alcohol. Drain thoroughly and dry out everything. The dry air from a scuba tank, or an ordinary hair dryer, is a great help here. Check for the cause of the leak and correct it if possible. When all parts of the light are dry, reassemble the light, and turn it on. If it does not work, open it up, replace or recharge the batteries (as appropriate), reassemble, and try again. If it still does not work, it may require more professional service from your dealer or the light's manufacturer.

SAFETY

The lights we tested appear to be well made, and should give satisfactory and safe service to the owner, if used with a little common sense. However, I feel some suggestions are in order.

Some dive lights come equipped with nylon lanyards. These can be attached to the diver's wrist to help prevent loss of the light. Other lights have holes in the handles for similar lanyards. In my opinion, lanyards can serve a very useful purpose. But, to be safe, they should be stretchable, and very easily removed. A much safer lanyard can be made from a short length of surgical tubing (available at most dive shops and many drug stores). This type of stretchable lanyard would provide the same protection against loss, but would release easily in an emergency, should the light get caught in the kelp, jammed between rocks, etc., where a nylon (or other non-stretchable) lanyard might trap the diver.

Batteries should be handled with reasonable care. They contain hazardous materials which can create problems and/or injuries if the battery containers leak. Old disposables and inoperative rechargeables should not be left in the dive lights for extended periods, but should be disposed of properly. Smash-

(Continued on Page 62)



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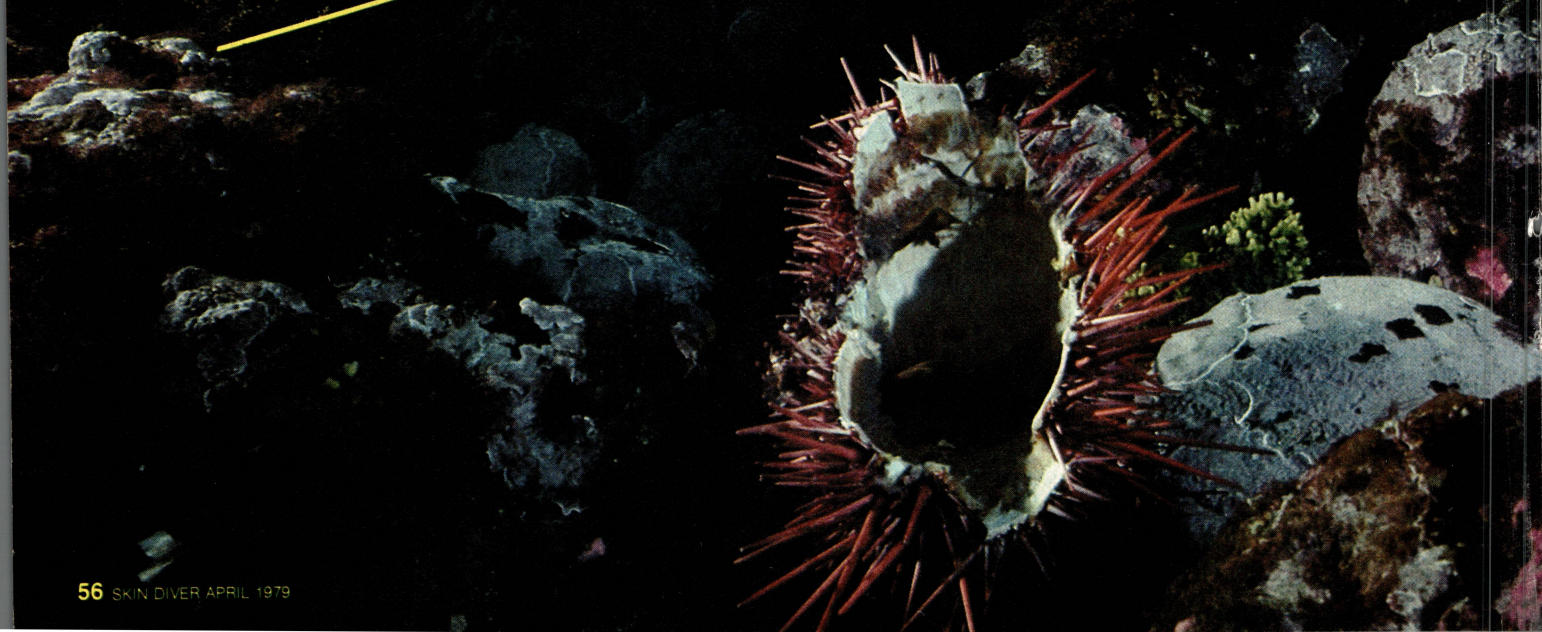


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THE NOV

fierce monster myth



exposé

Wolf eels must be the most gruesome looking of all creatures which inhabit the cold waters of Puget Sound. Certainly most divers in the area feel the wolf eel's appearance suits its reputation for a cranky disposition. Puget Sound is inhabited sparsely by sharks and frequently by killer whales, but the wolf eel probably is more respected by divers than either of the other two.

Wolf eels are very common in some areas and most divers can tell you one or two stories about somebody who was attacked by one. A diver in the Seattle area lost a couple of fingers when he inadvertently came to rest on one hiding in the kelp on the bottom. One spearfishing diver thought a wolf eel would be nice for dinner. His meal didn't look so appetizing when it began to wiggle up

by rick brock



photograph by Rick Brock



photograph by Rick Brock

Diver Dan Thomas found his fingers between a wolf eel's teeth (above) after forgetting to release the bait. The wolf eel applied no pressure with its powerful jaws and gently released Dan's fingers. Puget Sound divers Rick Brock and Ken Gatherum have found a wide range of personalities in their studies of wolf eels and have concluded that the gruesome-looking animal acts more like a puppy dog than a sea monster.



photographs by Ken Gatherum

WOLFE



the spear shaft and threatened to chomp on him! The wolf eel's mate confirmed this opinion when it reprimanded the diver by biting him on the seat of his wetsuit. A Port Angeles diver shot a wolf eel and ended up wearing it to the hospital attached to his shoulder. The wolf would not let go even after it died.

The wolf eel's massive, powerful jaws are made effective by a set of molar-type teeth which are used for grinding and crushing. A dive buddy of mine once observed a wolf eel come out of its den, pick an oyster off a rock, chew it up and swallow it as if it were a cracker. The broken remains of heavy-shelled snails are frequently found near the entrance to a wolf eel's den. The shells are crushed to obtain the animal inside.

Crabs are one of this eel's favorite foods and an eight-inch Dungeness can be dispatched with a single munch. Fishermen who have caught wolf eels on hook and line tell stories of their ability to leave a deep dental imprint on an oar blade. Some wolf eels have broken bottles lying near them in the bottom of boats. I have observed wolf eels crush a prickly sea urchin, paying only minimal attention to the eight-inch spines.

With stories such as these, neophyte divers stay well away from wolf eels. The thought of running into one was petrifying to me during my first couple years of diving. When I finally did see one, my buddy and I observed it only from the edge of visibility, about 15 feet away. We then quickly retreated, watching over our shoulders in case the dreaded wolf followed.

Finally, however, my interest in photography demanded a closer approach. The three foot distance required by the camera seemed much too close, but the wolf eels didn't seem to mind having their pictures taken. Their breathing pattern, however, sent chills through my spine because they open their mouths menacingly.

A wolf eel hiding in its den doesn't really make much of a picture. For better photographs, a way to get the animal out of its den had to be found. Feeding morays brings them out, so we decided to try feeding wolf eels. Abalone was my first choice, but not the eel's. Sea urchin roe worked better. And, what a rush when the ugly monsters came out to feed. It seemed as if we were truly flirting with danger.

We felt that our pictures were still not adequate and decided we needed a diver and a wolf eel in the same frame. But, no one was too eager to accept the posing job. It was much easier to hide behind the camera and take the pictures. Some sort of break-through was needed. As it turned out, the wolf eel provided it for us. One day I was crushing an urchin on the bottom to feed a large, eight foot adult male, lurking in his den about ten feet away. Temptation and impatience overwhelmed the wolf. He came completely out of his hole and dived between my working hands to gobble up the urchin. I jumped backward with great haste. Dan Thomas, a buddy, nearly drowned laughing. Ken Gatherum maintained his composure, however, and fired off our first good pictures.

After the dive we talked about what this aggressive wolf had taught us. The main thing seemed to be that we now had a way to entice an adult wolf eel out of its den during daylight hours. Most of us could remember only one or two previous sightings of wolves out in the open. But, did we really want a dangerous wolf out there with us? We tended to think so. Our wolf eel had not charged me, nipped at my fingers or displayed any aggression toward me. All he wanted was the food. After it was gone he merely turned around and headed home. He hadn't acted fierce. Maybe wolf eels were much more docile than we had been led to believe.

We decided to make a second dive that day to the same wolf eel den to do some more experimenting. We quickly found our wolf eel and began enticing him with urchin roe. He responded just as quickly and came out to feed even when we held the bait in our hands. Since we're not the heroic types, however, we always released the bait well before those powerful jaws got too close. Ken shot some more nice pictures and our confidence mounted. Our wolf eel was displaying non-aggression toward us. In fact, we thought we detected a note of fear in his behavior. After he devoured the roe and found himself out in

the open, he would turn around anxiously and swim back into his den. Maybe he was overcoming as many inhibitions about divers as we were about wolf eels. In any case, it seemed as if we were becoming friends. And we named him Wolfie.

The next day we returned to Wolfie's den but he would have nothing to do with us. Perhaps he had eaten too much the day before, because he totally ignored the urchin roe even when it was placed directly in front of him. The reluctance might also be credited to a small female that was sharing Wolfie's den that day. She was a cutie and it could be that Wolfie had lost his appetite for reasons other than overeating the previous day.

We decided that if Wolfie was going to allow himself to be henpecked we would have to find another wolf eel to photograph that day. We quickly found a neighbor and began feeding him. Careful coaxing brought about much the same results we had had with Wolfie. Our trust in wolf eels in general was building. We now allowed them to bump our hands with their mouths before we released the bait. We tested many different wolf eels. Most would come out to feed but with widely ranging degrees of reluctance. None exhibited any aggression.

We continued around the reef, making friends with as many of Wolfie's neighbors as we could. Only a couple were too snooty to accept our offers. We were overwhelmed. This animal is generally regarded as one of the dangerous inhabitants of our waters and we were virtually touring the neighborhood and shaking hands with everyone.

We even did a little dental work. George Wishant removed his glove to extract an urchin spine from inside the mouth of the largest old gray-faced wolf eel on the reef. Also, Dan Thomas once found his fingers between a wolf's teeth when he forgot to release the bait. The wolf eel applied no pressure but opened his mouth and let Dan remove his fingers. Our trust was now complete. We knew that as long as we didn't harass a wolf eel our safety was assured.

We found that wolf eels have a very wide range of personalities, but I'm sure none would attack without serious provocation. Wolfie is by far the most aggressive of all our wolf eels. That's probably why we had such good luck feeding him at first. He has become so bold that the sight of a diver outside his den will cause him to swim directly at the diver's faceplate until he bumps into the diver or gets something to eat. Oh, heart throb! Pity the poor unsuspecting diver. But Wolfie means no harm and will do no harm even if pushed away.

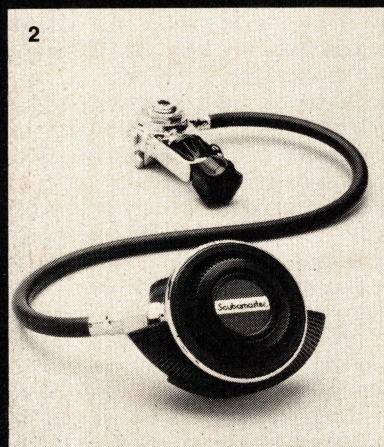
On the other end of the personality and aggression scale is a wolf eel we have named Gentle Ben. He is one laid-back, easy-going wolf eel. After being lured from his den, Gentle Ben will lie on the bottom taking all the food we can give him with no real anxiety about returning to his den. No anxiety is expressed either when he is handled or petted. It takes little coaxing to get him to swim with us. He tires easily, however, and likes to settle on the bottom for brief rests, appearing to blink his eyes as he recovers from the exertion.

Crab is supposed to be a wolf eel's favorite food. But, I caught Gentle Ben tenderly removing a pesky juvenile Puget Sound king crab from his den one day. The powerful wolf eel could have crushed the crab easily while carrying it in his mouth, but only wanted the intruder removed.

Since wolf eels have been dangerous to divers in the past, we can't advise anyone to handle and work with them as we have without due care. There is no reason why most divers couldn't, however, if they were patient and careful. I have worked with some of the same wolf eels for nearly two years and have a lot of confidence with individuals like Wolfie or Gentle Ben. When I encounter a new wolf, however, trust on both sides must start from scratch.

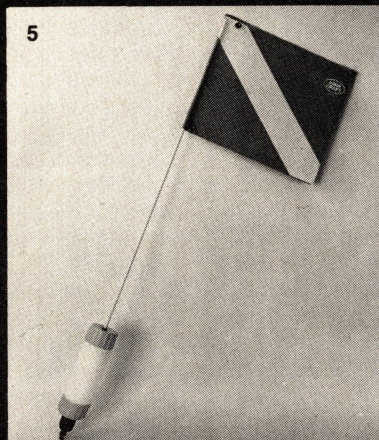
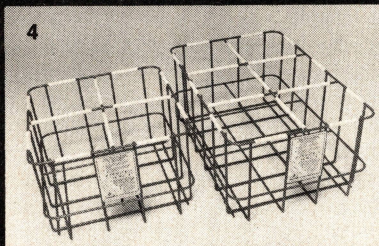
The extremely wide range of personalities must also be considered with special care. Some wolf eels have refused to accept food from us even after two years. Others leave their dens immediately to feed, clipping at the bait as well as at fingers. Know your wolf eel, or start cautiously until you do. Following this advice, I think most divers will find that a wolf eel acts more like an overgrown puppy than anything else. 

New Gear



1 Proflex Wetsuits—Combine Dupont Lycra and Spandex materials with the highest quality Rubatex neoprene to provide a new dimension in diver warmth and flexibility. Styled for both men and women, they're fully contoured for a perfect fit. About \$240. From Scubapro. Available at your Scubapro dealer.

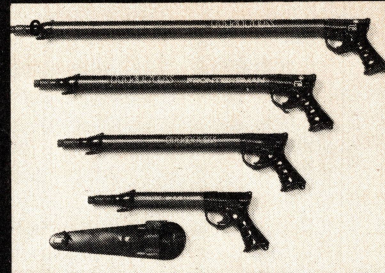
2 Scubamaster Regulator—Designed to provide easy breathing and smooth, trouble-free operation. Model #1687 has a contoured silicone diaphragm, Teflon-tipped demand lever and a completely redesigned second stage case to deliver uniform air flow. \$166.70. From Scubamaster. Available at your dive shop.



3 Seajacket—A comfortable, streamlined, jacket BC designed to give the diver buoyancy where it's needed. It has a rapid exhaust dump valve, low pressure inflator, CO₂ cartridge (optional) and utilizes most BC packs. Comes in blue with silver trim. \$220. From SeaQuest. Available at your SeaQuest dealer.

4 Pelican Rack—An improved version of the popular Pelican tank rack designed for safe, easy transportation or storage of scuba tanks. Sturdier welding, new anti-rattle sleeves, and lighter weight make this a must for active sport divers. Six-pack, \$40, four-pack, \$35. From Pelican Products, Torrance, California.

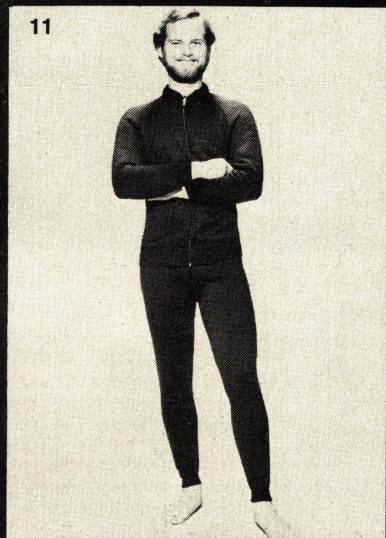
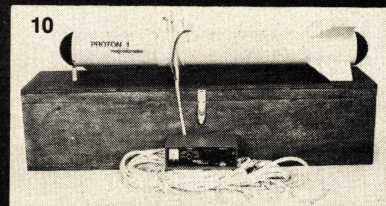
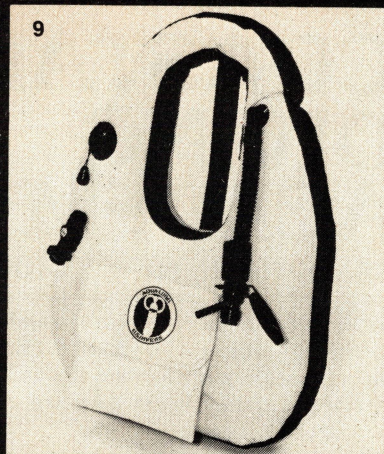
5 Divers Flag—A bright red flag with four-inch wide white stripe to mark your spot. Buoy has four-foot tall fiberglass staff and lead weight. Stiffener keeps flag straight at all times. Fade resistant and waterproof, the flag is used to ensure diver safety. \$14.25. From Aqua-Craft. At your local dive shop.



6 Mares Muzzle Loaders—Streamlined and accurate, these pneumatic spearguns are more powerful than rubber sling guns and have a power regulator for open water or tight quarter fishing. The four shown range in price from \$95 to \$129. From Mares, 722 Genevieve St., Suite M., Solana Beach, CA 92075.

7 Aqua-Lung Quilted Jacket—An attractive cool weather jacket with a quilted lining and an oxford nylon outer shell. It features a stylish polyester knit "Aqua-Lung" stripe and has corrosion resistant snaps and zipper. Available in sizes XS to XL. \$34.95. From U.S. Divers. See your U.S. Divers dealer.

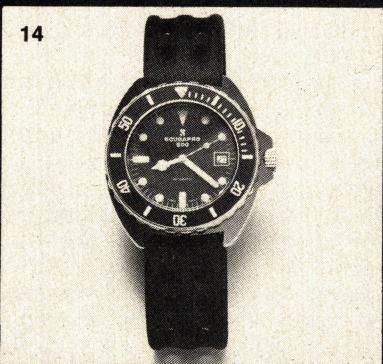
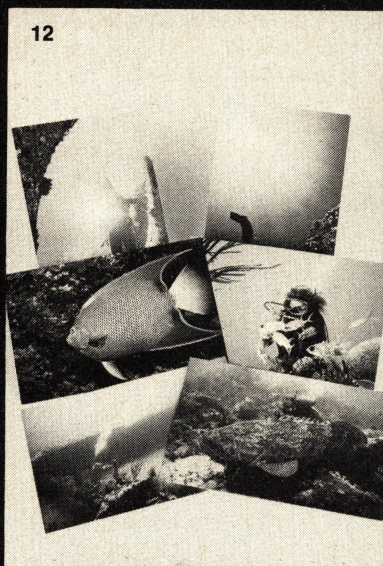
8 Abalone Pendant—An exact replica of a small abalone shell, artfully designed by Nathaniel, a well-known manufacturer of environmental jewelry. The pendant is available in sterling silver, \$25, and 14 kt gold, \$125. Chain is included. From Nathaniel Mfg., 7012 E. Double Tree Rd., Scottsdale, AZ 85253.



9 Aqua-Lung BC — A double bag buoyancy compensator featuring a tough nylon outer bag and a strong urethane inner bladder. Models 706 and 707 are equipped with a standard overpressure valve, oral inflator, 39 gram CO₂ cartridge, pocket and special Y-harness. \$95.35. See your U.S. Divers dealer.

10 Proton Magnetometer—A highly sensitive instrument that detects large metal objects 800 feet away. It consists of a control box, four foot long "fish" and 150 foot tow line. It operates on 12 volts DC. \$2850, with instructions and map of magnetic fields. From J. W. Fishers Mfg. Co., Anthony St., Tauton, MA 02780.

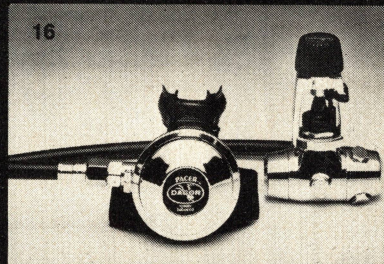
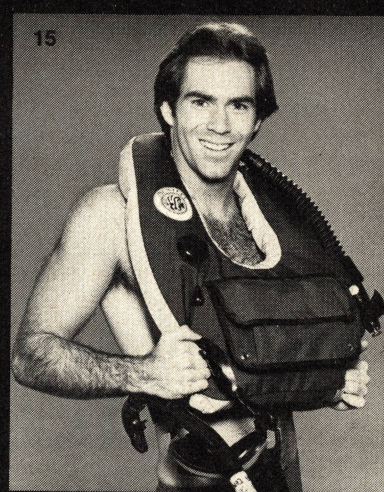
11 Two-Piece Undergarment — A comfortable, nylon-pile undergarment specially designed for use with Poseidon Systems' Jetsuit drysuit. It has ribbed cuffs, a modified crew neck and an elasticized waist to provide easy movement. Available in navy blue with optional socks. Sizes S to XL. \$150. Poseidon Systems.



12 Color Postcards—Show a diver feeding fish on the *RMS Rhone*, the bow and stern of the *Rhone*, a French Angelfish, a 300 pound jewfish, and a sunburst. All were taken by U/W photographer, George Marler. \$1.25 for all six, includes air mail postage. From Aquatic Centres, Box 108, Road Town, Tortola, British Virgin Islands.

13 Visa-Pure Defogger — A special blend of space-age liquids developed to prevent mask fogging in any situation. It contains no soaps or petroleum products, is safe around pools and will not harm rubber or metal. Eight ounce bottle, \$4.50. From Aquidneck Enterprises, 116 Cushman Ave., E. Providence, RI 02914.

14 Diver's Watch—Features a fine, 17 jewel movement, automatic winding and calendar. A specially contoured stainless steel case protects the watch crown, and it's pressure tested to 50 atm (1650 feet). Comes with flush-mounted stem and matching or contrasting bezel. \$220. Available at your Scubapro dealer.



15 Sunfish BC—Constructed of durable Tuff Tiger Threads and an inner bag of new compound polyurethane designed to withstand salt water, chlorine, ozone and heat. It's guaranteed for workmanship and materials. Available in five bright new color combinations. \$133. From Seatec. Available at your Seatec dealer.

16 Pacer Regulator—Provides reduced breathing effort with a patented Venturamatic Flow Vane in the second stage and a balanced first stage. Model 900 is a high performance regulator, permitting effortless breathing at any depth and under the most extreme conditions. \$165. Available from your Dacor dealer.

17 Lift Bag—A valuable diver's tool used to lift heavy objects to the surface. Constructed of two layers of durable polyethylene, the bag can easily raise 200 pounds when filled with air. It's maintenance free and easy to use. \$4.95. User's manual included. From Lift Bag, 15 Rogers Point, Eliot, Maine 03903.

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IN THE DARK?

(Continued from Page 54)



ing or breaking up batteries may cause the hazardous materials to splatter. Disassembly of batteries can also spread these materials. Placing batteries in fire may result in the battery exploding and/or generating toxic fumes.

Because the rechargeable batteries can deliver a high electrical current, they can cause electrical shock and burns if short circuited ("shorted"). Avoid touching the uninsulated battery leads with bare hands, or any other part of the body for that matter. (Being safe spoils all the fun.) When working around batteries, be careful with metal tools, jewelry (rings, watchbands, bracelets, keys, etc.) or placing the battery on a conductive surface (metal work bench, wet boat deck, etc.).

In the event of overcharging a rechargeable battery, it will generate and may release explosive gases (normally, only if overcharged to extreme). As a safety precaution, batteries should be charged in a well ventilated area, away from sources of ignition (open flame, electrical switches, etc.), and outside the housing, if the battery is removable. If the battery is not removable, then the housing should be left open for a short time (15 to 30 min.), to allow any gases to escape before reassembling. Lights that allow charging the battery through a small, watertight port (where the light housing is not otherwise opened) should provide adequate ventilation for any explosive gases that might form while overcharging, or for catalysts inside that render the gases harmless.

Some of the lights we tested have been in use for years. Others are newer and more sophisticated. When assembled together, they cover a wide range of designs, sizes, beam intensities and widths, applications, and prices. With such a broad diversity of dive lights, selecting one for your own use is no easy task. It is hoped that this two-part article will ease that difficulty. >

COMING IN MAY: In next month's **SKIN DIVER**, author George Cozens will present the results of laboratory tests conducted on more than 30 different dive lights.

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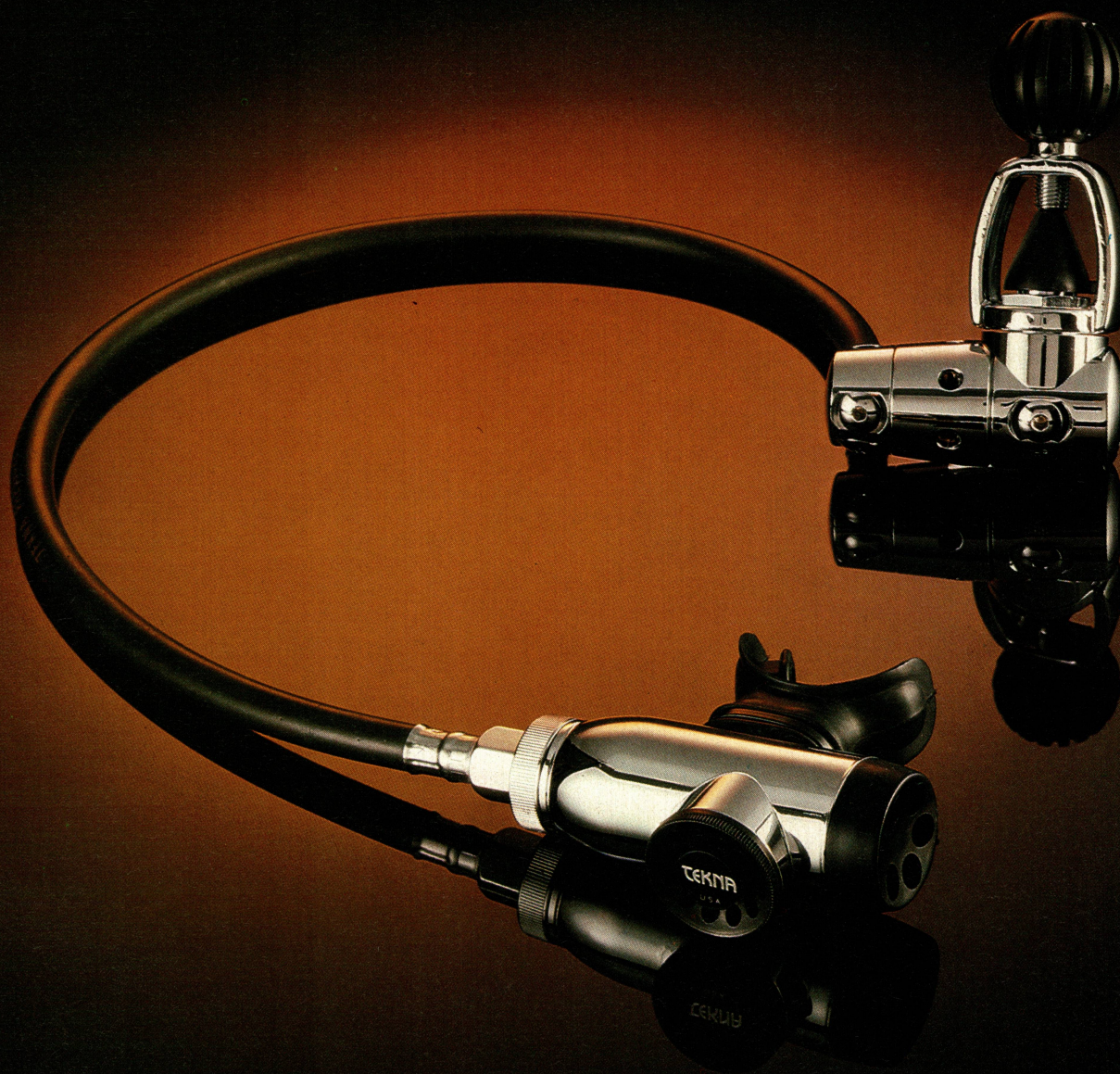
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The fire-red mantle and long, flowing white tentacles of the file shell are an impressive sight for a Caribbean reef diver to chance upon. Normally found nestled in the safety of a coral crevice, this incredible little clam can swim away from predators or relocate to different feeding areas simply by clapping its shells together.

Sometimes called the flame scallop, the file shell's Latin name is *Lima scabra*. *Lima* means file and *scabra* means rough. The edges of the shell are usually corrugated and roughened, giving the animal the appearance of a carpenter's rasp, hence the name, file shell. The halves (or valves) of the oval shell are equal in size, usually two to three inches in diameter.

Aside from the brilliant red mantle that can be observed when the valves are slightly parted, the most prominent feature of this mollusk is the double fringe of long and slender, brightly colored tentacles. These finger-like projections can be pure white, orange, or pink and are so long they cannot be fully withdrawn into the shell. Even if the shell is clamped firmly shut, the telltale tentacles protrude along the edges. In some file shells the tentacles are autonomous. That is, the animal can let go of them. If, for example, a predator should grab the tentacles, the tentacles will come off and the file shell remains unharmed.

Although they possess the ability to swim, file shells will settle down in a good feeding place. Wedged snugly among rocks or coral, they secrete special threads that create an anchorage as well as a nest. During feeding, the file shell opens its valves to pump water into the mantle cavity, filtering and collecting plankton and algae for digestion. The water is discharged at the posterior, near the hinges, creating a feeding current that enters one doorway and leaves at the other. The tentacles screen out any particles too large for consumption.

To watch a file shell swim through the water is a comical sight. The animal zig zags through the water in a series of jerking movements by opening and closing its valves, sending out jets of water in the process. It looks as if it were a pair of unattached dentures "biting" itself forward. By controlling the muscles of the mantle flaps, *Lima scabra* can go in any direction it wishes, left or right, up or down.

Next time you wander past a crevice on the reef, take a few minutes to look for the tentacles of this intriguing creature. To view the brilliant colors of the file shell is memorable, to encounter one swimming through the water, unforgettable. »

*Text and Photography
by Geri Murphy*

The File Shell

Flaming Filter Feeder of the Sea







Tekna's T-2100 Regulator

Introducing A Racy Little Breathing Machine With Hair Trigger Response

By Paul J. Tzimoulis

The Tekna manufacturing company of Menlo Park, California has recently begun delivery of a radically different regulator which is causing quite a ripple in the diving fraternity. Tekna already has a reputation for innovative dive equipment, and the company's new scuba regulator perpetuates this. It operates on a totally different principle and behaves far differently than most present day breathing units. And, the manufacturer claims it *never* needs adjustment or maintenance of any kind other than a thorough rinse after use. Stirring a controversy of debate and opinion, the T-2100 has been met with mixed reactions.

The first stage of the Tekna T-2100 is the classic balanced piston design which has proven to be the workhorse of the scuba industry. Aside from a cleaner, more cosmetic appearance, there is little difference between this first stage and other high-performance models currently on the market. In fact, many of the O-rings and internal working parts are standard and interchangeable with other models. Perhaps the most distinctive feature of Tekna's first stage is the ball-shaped yoke screw which fits perfectly into the cupped palm of your hand for a more comfortable grip.

The one significant difference in the internal design of this first stage is the enlargement of the diameter to give 28 percent more area for the swivel retainer orifice, thereby allowing greater flow of intermediate pressure air. This larger bore orifice is especially effective at low tank pressures of 300 psi or less.

The essence of Tekna's design principle lies in the second stage configuration. Here, the veteran diver will find everything is different. The outer case is cylindrical in shape with smoothly contoured edges and a single, side exhaust port. The regulator is omni-directional and can be worn with the hose over the right or left shoulder, depending on personal preference. It is one of the few regulators on the American market which allows such a choice.

Another feature of the T-2100 which is immediately obvious is its light weight. The second stage assembly weighs a mere nine ounces. In fact, it is so light that you momentarily wonder if it will be strong enough to withstand the rigors of being banged around in a dive gear bag or the deck of a rocking boat. Don't let the lightweight construction deceive you. Because of its cylindrical case and compact design, this little regulator is actually tougher than most.

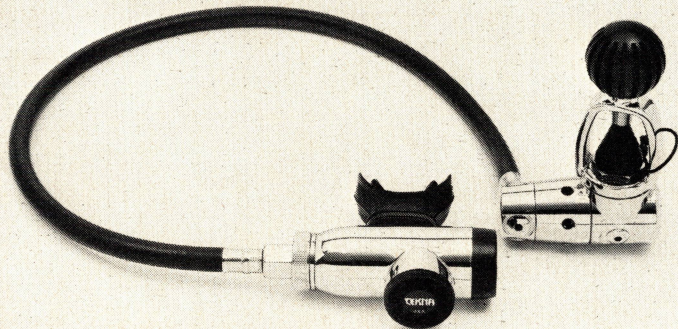
Probing the internal workings of the T-2100 second stage is a fascinating but somewhat mystifying experience. It is at first difficult to fully grasp the basic concept of this unique design because it is so different than anything you've seen before. There is no way to compare the T-2100 with other regulators since its basic principles of function are so different.

To begin with, the T-2100 has an inhalation diaphragm which is by far the smallest in the industry. Barely the size of a half-dollar, it is one-third the size of its contemporaries. It is also made of an entirely different material, only recently developed out of space-age technology. In fact, the exact formula for this fluoro-elastomer compound is a well kept secret. One has to wonder how this regulator has achieved such incredible breathing sensitivity with such a small diaphragm.

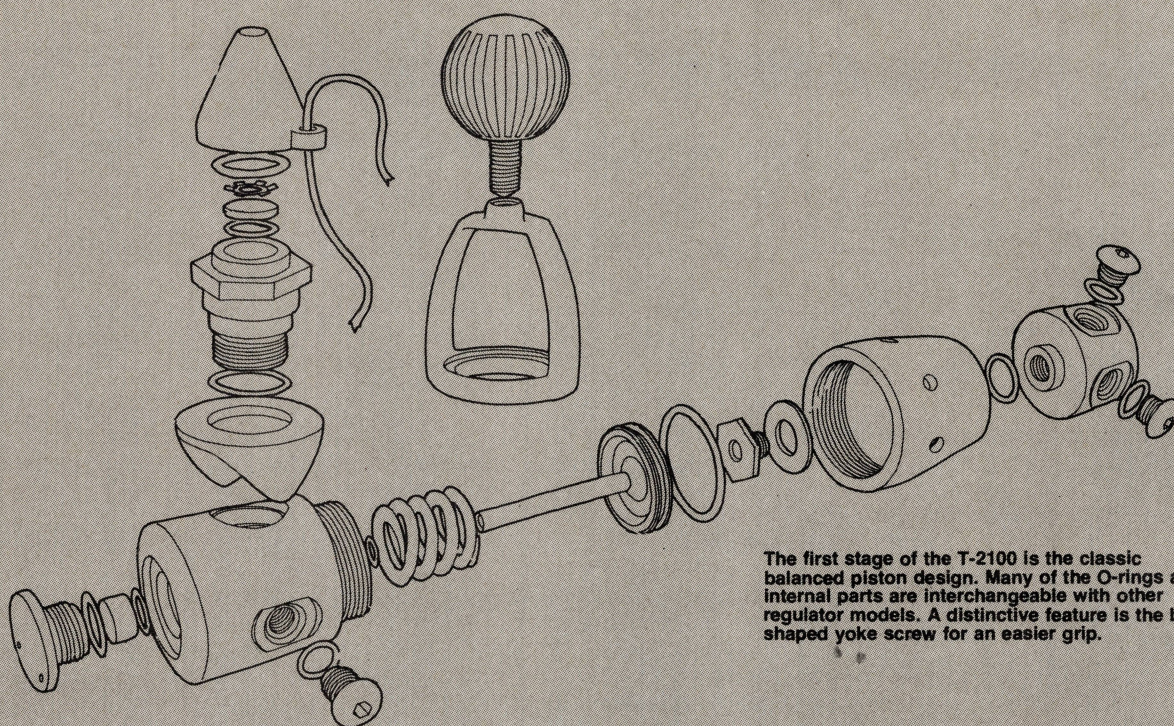
The next big surprise is that the second stage actually contains two diaphragms whereas most other regulators have only one. That's right, two diaphragms. But the second one is not utilized for sensing ambient pressure. This second, unseen diaphragm is buried deep within the internal workings of the second stage and operates as a main pressure valve. Slightly less than the size of a quarter, this pure neoprene diaphragm is the control valve that admits intermediate pressure (135 psi) air into the second stage. The use of a diaphragm valve is an ingenious improvement as it eliminates the knife edge valve seat problem of poppet valve designs. According to the manufacturer, this type of valve mechanism can endure 30,000 dives without the slightest sign of wear.

The clever twist to this particular diaphragm valve is its ability to control the airflow on a proportional basis rather than a conventional on/off basis. This valve can very carefully measure the amount of airflow, dependent upon demand. This is accomplished by a series of concentric rows of small holes drilled through the face of the valve. The inner circle contains a row of 5 holes, the middle circle has 10 holes and the outer circle contains 15. As the demand for air increases, the diaphragm bulges outward, uncovering more holes and thereby increasing the airflow. This proportionality is the key to the T-2100's finite control of high volume airflow.

The main diaphragm valve is held in place by a clamping washer which allows it to flex outward to a maximum of only ten-thousandths of an inch, thus preventing any possibility of overflexing or excessive wear. This main valve is activated by



Scuba instructors Chris McLaughlin and Shari Kurgis (facing page) test dive Tekna's new T-2100 regulator in the Bahamas. Operating on a totally different principle than most present day breathing units, the T-2100 is virtually maintenance free and never needs adjusting. Also, inhalation effort remains constant, regardless of water depth or tank pressure.



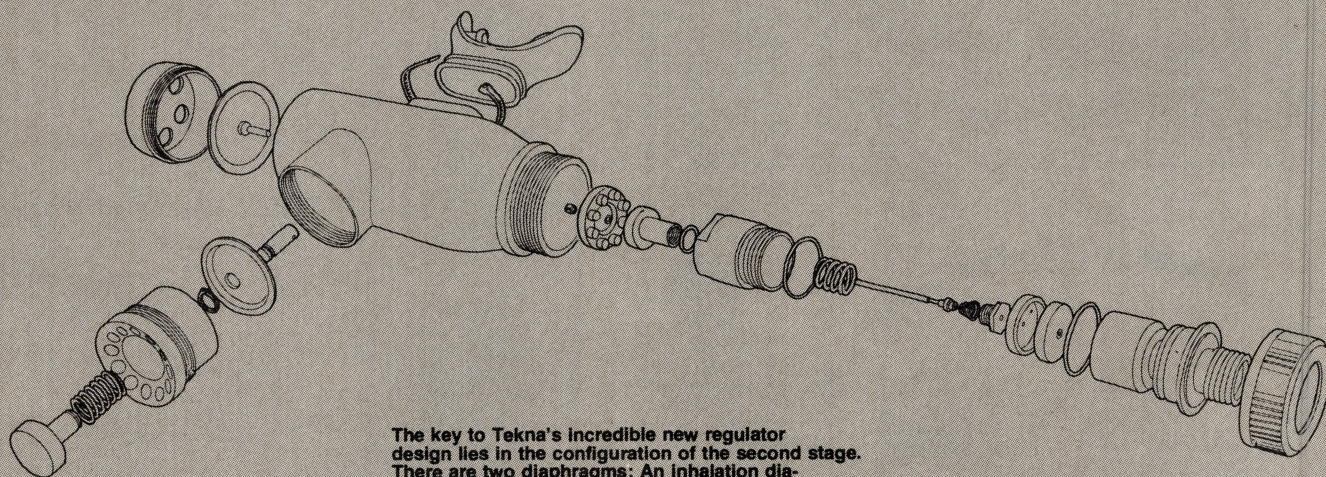
The first stage of the T-2100 is the classic balanced piston design. Many of the O-rings and internal parts are interchangeable with other regulator models. A distinctive feature is the ball-shaped yoke screw for an easier grip.

a drop in pressure in the valve chamber. The pressure within the chamber is balanced to 135 psi and is equal to the hose pressure on the opposite side of the diaphragm valve. At the other end of the valve chamber is a tiny servo-valve, or pilot valve, connected to a long, slender stainless steel stem, known as a whisker valve. Because of its high mechanical advantage (leverage), it takes only the slightest effort to activate this whisker valve. As you inhale, the inward motion of the inhalation diaphragm tilts the whisker valve ever so slightly and causes air to escape from a small valve chamber. The reduction of air pressure in this chamber in turn activates the main diaphragm valve, causing it to bulge outward. As this happens, a large flow of air begins to enter the second stage.

This particular design has been tried and tested in other fields of technology but this is its first application in a scuba

regulator. Industrial valve designers call it *fluid amplification*, which means that the smallest fraction of pressure can be amplified by an incredible ratio of 2700 to 1. In other fields of valve design the system is sometimes called a *servo-assisted valve* or more commonly, a *pilot valve*. Regardless of the name used to describe this mechanism, one must admit that it has tremendous benefits. The application of this principle allows the diver to induce a large airflow with just the slightest touch. In fact, the T-2100 is so sensitive it will deliver air at a cracking pressure of 0.9 inch water column inhalation effort. The manufacturer has discovered this setting too sensitive for the average sport diver and has now begun delivering models at a revised setting of 1.2 inch water column inhalation effort.

Although the design and function of Tekna's second stage is relatively simple, it will not be easy for most divers to under-



The key to Tekna's incredible new regulator design lies in the configuration of the second stage. There are two diaphragms: An inhalation diaphragm, by far the smallest in the industry, and a second, pure neoprene diaphragm which operates as a main pressure valve.

stand because it is so alien to their present knowledge and experience. I have watched dive instructors and shop owners witness a complete disassembly and reassembly demonstration by Tekna representatives and still walk away expressing amazement as to how the regulator actually functions. The mechanism appears so incredibly small and simple, yet the little device delivers a whirlwind of air. According to Dr. Glen Egstrom at UCLA's underwater testing laboratory, the Tekna T-2100 delivers a tremendous volume of air, particularly at deeper depths.

The controversy over the T-2100 stems from its behavioral characteristics in the water and the need for its users to modify their dive methods. First of all, this is the only regulator on the market today which is equipped with a mandatory purge button. That's right — the diver *must* use the purge button to fully exhaust any water trapped in the second stage. Exhaling into the mouthpiece will not fully purge the second stage canister, and the first breath can deliver a surprising stream of water into the diver's mouth.

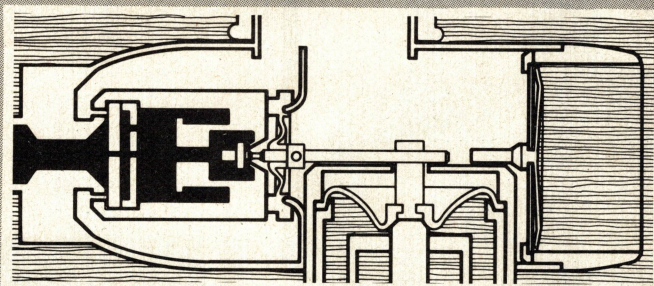
Much of the early criticism and dissatisfaction with the T-2100 can be traced back to the fact that most divers never bothered to read the directions supplied by the manufacturer, or really didn't believe the purge button was necessary. There are, of course, some divers who refuse to alter their style of diving and find the mandatory use of the purge button a nuisance. However, there is virtually no problem in evacuating residual water from the second stage if the diver is willing to use this simple button in the manner for which it was designed.

Another aspect of handling the T-2100 in the water is learning proper control of the airflow. This regulator has the capability of generating a tremendous airflow but can also deliver equally small amounts of air if the user knows how to control it. Optimum breathing performance is achieved by deep, slow inhalations and deep, slow exhalations. This breathing technique, characteristic of experienced divers, produces a breathing rate of around six breaths per minute. If a diver needs a large volume of air, as in an emergency or while working hard underwater, he or she needs only to breathe harder and the regulator will go "positive." That is, it will inject air into the diver's mouth, requiring no extra effort from the diver. This is similar to the effect of a commercial, push-pull breathing rig.

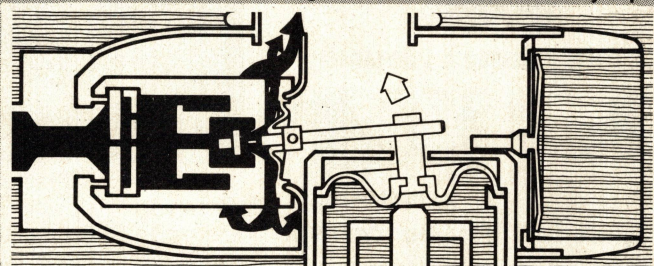
It generally takes two to three dives with the T-2100 to fully master control of this highly sensitive breathing machine. It is like stepping out of a Volkswagen into a brand new Ferrari.

Still another behavioral characteristic of this regulator which may appear disconcerting is its tendency to be overly sensitive in shallow water. Because of the unit's sensitivity, small fluctuations in water pressure (from surface wave action) will frequently cause momentary free flow. It must be remembered that this ingenious little regulator can sense even the slightest changes in pressure and will immediately start producing air. Some divers have indicated that the regulator feels jumpy in shallow water and are concerned about this odd behavior. For example, the regulator has a tendency to free flow while you are snorkeling on the surface and trailing the second stage at your side. The best way to prevent this is to hold the second stage in your hand with your thumb pressed over the mouthpiece opening. One instructor even noticed that the regulator had a tendency to deliver air as he swam forward through the water. Apparently the wave pressure of his forward motion was sufficient to activate the breathing diaphragm.

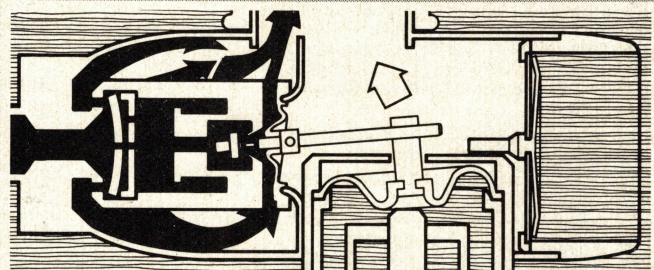
Frankly, the jumpy behavior of the T-2100 in shallow water is the price one must pay for having an ultra-sensitive regulator which can deliver large volumes of air at deeper depths. Open water tests by SKIN DIVER Magazine indicate that the regulator behaves beautifully at depths of 35 feet or deeper and there is a significantly noticeable difference in air delivery at depths



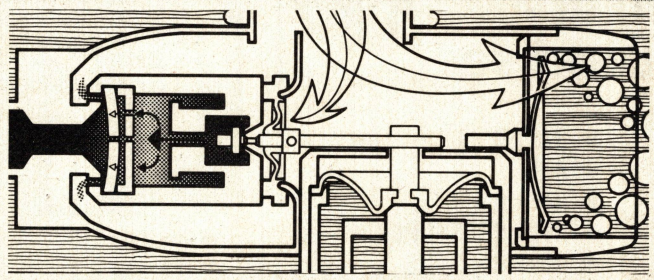
1 The T-2100 second stage uses a pilot valve to open and close the main valve. So breathing effort remains constant at any depth.



2 As the diver inhales, the pilot valve is opened by the inward motion of the diaphragm and air escapes from the control chamber. This drop in chamber pressure causes the main valve diaphragm to flex upward.



3 As the main valve opens, intermediate pressure air enters the second stage housing. This air stream creates a vacuum in the second stage housing, thus reducing inhalation effort as the demand increases.

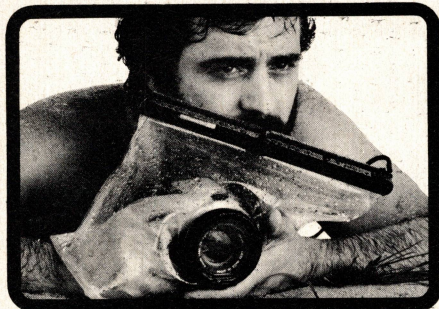


4 When the inhalation stops, the inhalation diaphragm returns to normal position, closing the pilot valve and, in turn, the main valve.

greater than 80 feet. As ambient pressure increases, air density increases, producing a smooth, steady flow of air without the slightest effort. Inhalation effort does not change, regardless of depth or tank pressure.

Because of its revolutionary design and unusual behavioral characteristics, the Tekna T-2100 regulator has become the center of a debate among instructors, shop owners and veteran divers. Some love it, some don't. It is obviously not the kind of regulator everyone wants, but it seems to be ideal for the diver who seeks high performance and sensitive response. And one thing is certain: The T-2100 is unique among scuba regulators today. The T-2100 is priced at \$189.95. For more information contact: Tekna, 3549 Haven Ave., Unit E, Menlo Park, California 94025. >

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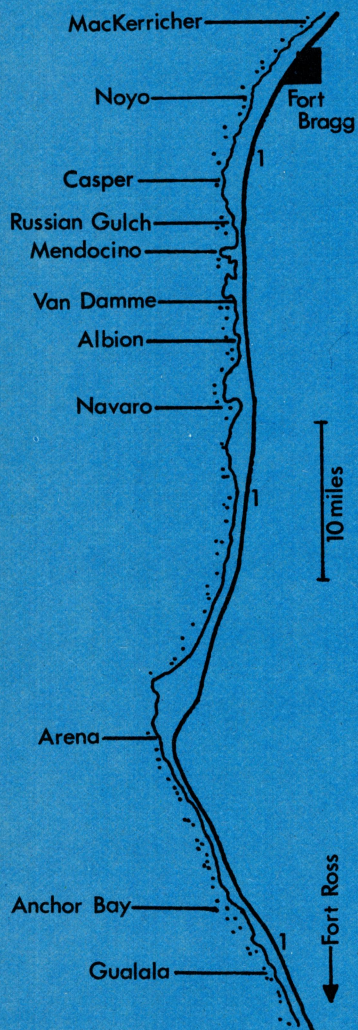
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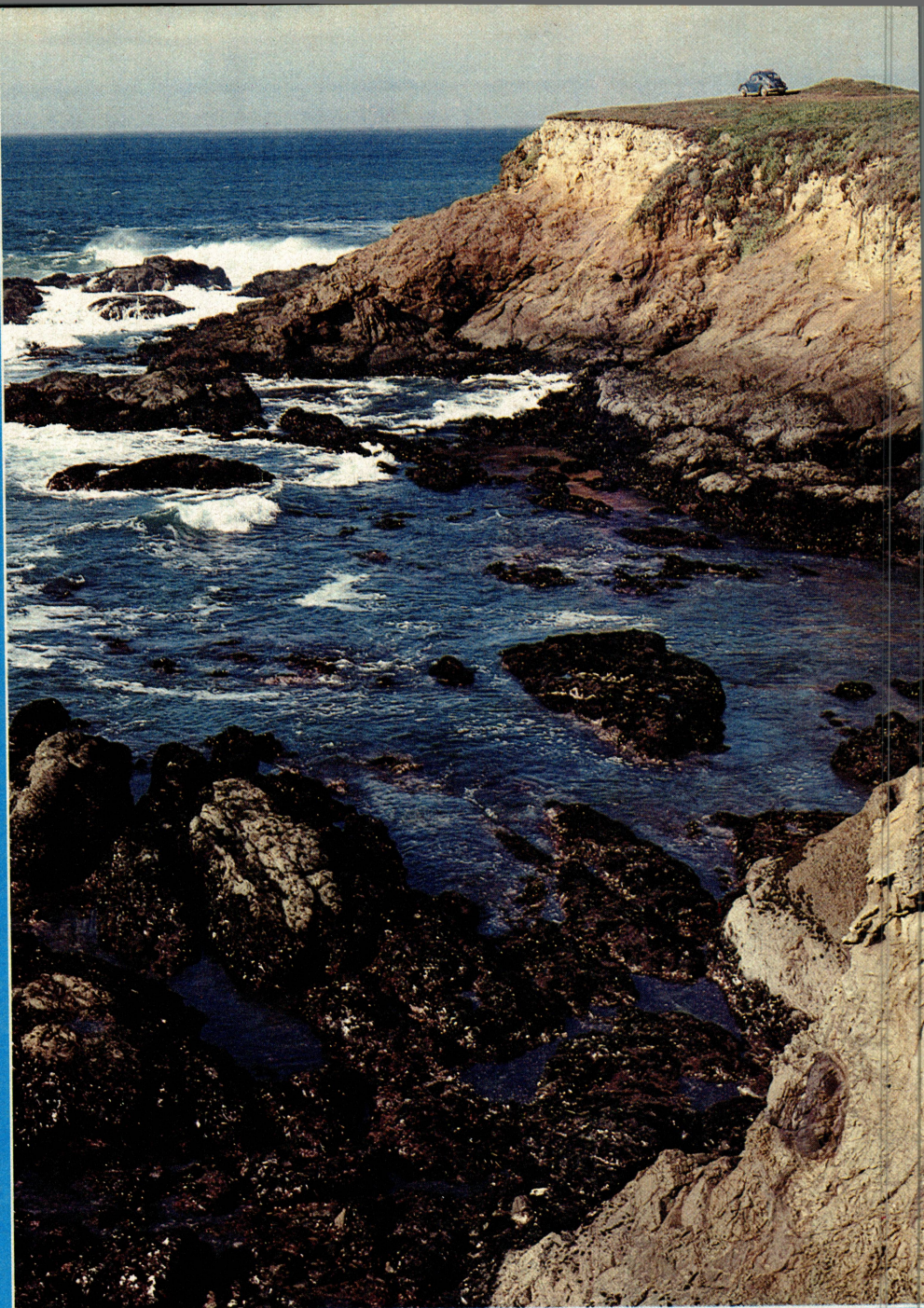
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Steep cliffs such as those south of Noyo Cove (right) form a barrier to many Mendocino beaches. But, Anchor Bay (below) provides a safe, convenient access.



Something very striking about California is the incredible change in coastal geology as one moves from the south to the north. The southern part of the state is everybody's idea of California — hot sun, palm trees, and miles of sandy beaches. Northern California, on the other hand, won't sunburn you as often; it has beautiful huge redwoods and miles of sea cliffs. As a matter of fact, it is perhaps the steep cliffs of Northern California that form the greatest barrier here between divers and the sea.

But a peculiar thing has happened. The north coast's Mendocino County has a subtle sprinkling of white sandy beaches all along its 100 mile tideline. It is these isolated pockets of "Southern California" that lure thousands of divers into the Pacific every year. Mendocino County is the northern boundary for a substantial portion of California's dive community. North of here there is much less diving because of the inaccessibility of the beaches, few dive shops, and hostile weather conditions.

sites and discuss some items that may be important to divers headed toward these waters.

Anchor Bay, 30 miles north of Fort Ross, is one of the more interesting dive sites. Access is through a private campground (with pool!) shaded by tall redwoods. The short, level walk from camp ends at a wide sandy beach. There is a broad point to the north that effectively protects the beach and creates generally safe surf conditions. Visibility near the shore is poor, around six to eight feet, while farther from shore (several hundred yards) visibility can reach 30 feet.

The bottom near shore is mostly sand, but rock predominates where the water is over 20 feet deep. There are some small, interesting islands to the south that are good for fish and abalone. The finest diving to be had at Anchor Bay is around Fish Rocks, almost one-half mile to the north. These islands feature pockets of abalone and many species of fish in addition to some intriguing geology. On the seaward side of the rocks the water is over 60 feet deep, while around the islands the water is about 30 feet deep.

near the islands to the south and along the point to the north. Throughout the entire area, the bottom is not much more than 40 feet deep. Outside the cove to the north divers can work the wreckage of the *Enterprise*, but a boat and guide are needed to reach it. Near the parking area is a restaurant and campground (of sorts), and the town a mile back up the road is a pleasant place.

Navaro-by-the-Sea is a quiet little beach settlement 18 miles south of Fort Bragg. Highway 128, a main artery to the coast, meets the ocean here. Access to the beach is via the road on the south side of the bridge. During wet years this road gets quite messy. Access is free, parking is unlimited, and people may camp out on the beach even though there are no facilities.

The only good diving in this area is around the rocks on the north side of the river mouth. Crossing the river is usually safe when it is not full of spring water. Or, you can jump into the ocean and swim north a few hundred yards. Either way, the cluster of islands has variable visibility directly connected with the river

MENDOCINO

the other California Text and Photography by Mark E. Gibson

The Mendocino coast along Highway 1 is considered at least a weekend outing by most divers departing the San Francisco Bay area. Scattered along it are campgrounds, motels, state parks, and attractive small towns. Many of the dive sites are located in the more rugged, natural settings.

Dive interests on the coast include spearfishing and free diving for abalone (scuba is not allowed when taking abalone) mixed with some open water training. Photography takes a back seat in these rugged and often silted waters. However, there are those days, and quite a few of them, that offer great conditions for photography, too.

Let's begin at the southern boundary of Mendocino County, and work our way north to Fort Bragg, our northern dive boundary. I will point out at least ten dive

A special feature here is the wreckage of the *Crescent City*. Lying in about 35 feet of water, the remains of this ship can be found on the south side of the islands. This is one of the few divable wrecks on the Mendocino coast.

Arena Cove, 40 miles south of Fort Bragg, is reached by turning west onto Kinny Road from the Coast Highway in Point Arena and following the road a mile or so until it dead-ends at the cobblestone beach. This is a free access with plenty of free parking. Like Anchor Bay, there is also a point to the north that protects the cove and generates normally safe surf conditions.

This is not one of the more popular Mendocino dive sites because of the usually poor visibility (five or six feet) and a fairly monotonous rocky bottom. Yet many good sized abs and fish are taken

flow — spring is not the best time to dive this area. Around the rocks the water is no deeper than 40 feet, while on the western edge it is considerably deeper.

Pockets of large abalone can be found on the northern sides of the rocks, while fish are more plentiful in the western, deeper waters. Divers interested in a little adventure can walk north along the ocean and find a wild and interesting shoreline.

Albion Cove, 16 miles south of Fort Bragg, is one of the longest and most well protected coves on this coast. Access to the flats under the bridge is via the road at the northeast end of the bridge. There is plenty of parking near the water, access is free, and there is a campground only a stone's throw from the water.

Most divers spend their time in the

MENDOCINO

cove because it is almost a mile to open water. But diving in the cove can be very good, particularly along the rugged north and south walls. The bottom is rocky and not much over 30 feet deep. Abalone and crabs are found here. Spearfishing gets much better toward the mouth of the cove in about 50 feet of water. Boat traffic here is quite heavy, so divers should stay out of the traffic lanes and use a diver down flag at all times. At the campground you can rent diveboards (a great opportunity for test-driving!).

Van Damme State Park is 13 miles south of Fort Bragg on the Coast Highway, and the access is super easy. The spacious parking area is situated between the highway and the sandy beach, and there is no fee. This area is very well protected from heavy seas and is used extensively by divers. Few fish and abalone are found here as a result of steady diving pressure. However, there are number of rewarding dive sites if you are up for the swim. Divers with substantial endurance can reach the islands directly offshore about one-half mile. The water around the islands is shallow, maybe 20 feet, but it gets much deeper seaward of the rocks. Fish and abalone can still be found here.

The shore to the north and south of the beach is very rugged and is delightful for exploration. Caves, tunnels, islands, channels, and unique formations make for great visuals. Abs and fish also are more plentiful in these outer areas. The central cove area, adjoining the beach, is sandy and not very interesting.

The beautiful town of Mendocino, 11 miles south of Fort Bragg, features two very distinct dive environments. On the north side of the peninsula, along Heeser Drive, is a rugged cliff area that sports a few paths down to the water. This area can be very dangerous because it is so rocky and exposed to northern swells. Strandings are frequent in rough weather — don't you be one. If you can get in safely, you will find many, many, urchins, a few abalone, and fair numbers of fish. Visibility can be quite good — up to 30 feet — after a few days of calm weather. Normally it is closer to 15 feet.

The other access is the beach on the south side of the peninsula, which can be reached via the road at the northeast end of the bridge. Once parked (don't get stuck in the sand), there is either a long walk or swim involved before the diver reaches the central cove. The bottom here has much sand, is not much over 25 feet deep, and generally holds little of interest to divers. Better diving is to be found almost one-half mile from the beach near the rocky shore of the peninsula. The distant south wall of the cove,

over one-half mile from the beach, is good for fish and abs.

Russian Gulch State Park, nine miles south of Fort Bragg, is one of the most inspirational and natural areas along this coast, and the diving usually is very good. There are two areas where divers can reach the water and, like Mendocino, each is distinctly different.

The northern portion of the park has a steep and rocky shoreline, but there are several places where safe paths lead down to the water. There are many islands and caves in this area which provide interesting areas for exploration. Fish are generally sparse and abs small until the diver moves to water at least 25 feet deep. This area usually has good visibility, often over 20 feet.

The other access is from a small sandy beach at the base of a long and narrow cove. Diving near the beach is poor (shallow, silty water) but once nearer the north point, or around the southern point in the adjoining cove, the conditions and scenery get better. Depth in these two areas is around 30 feet at most, with deeper water available well outside the mouth of the cove. Abalone and fish are lacking in the waters near shore, so the diver must swim quite a distance to more remote areas before the wildlife is sufficient. There is an interesting tunnel through the second point to the south — at low tide it is visible from the water level.

Casper Beach, five miles south of Fort

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Bragg, can be reached by turning west onto Point Cabrillo road on the south side of the Casper Bridge. The beach is but a mile down the road, and access is free. There is limited parking.

Casper is used infrequently by divers because of shallow water, a sandy bottom, and a general lack of interesting features until one is almost one-half mile from the beach. Better areas for fish and abs are the rugged north and south walls of the outer cove. Many islands and wash rocks near the south point offer features of interest to divers.

Noyo Cove, on the south side of Fort Bragg, is a popular dive site because of free access, spacious parking, and ease of access into the water. The rocky beach and breakwater can be reached by turning east onto Harbor Drive at the north end of the bridge and following the road until it dead-ends under the bridge.

This cove is known for the relatively large abalone it gives up to divers willing to swim almost into the open water along its walls. Smaller abs are scattered over the entire bottom, and fish are more abundant toward the mouth. Depth in these areas is not much over 35 feet, with most of the bottom near shore much shallower than this.

Another access in this area is to the south next to the trailer park. Turn west onto Ocean View and continue to the top of the bluffs. The water is very shallow, and frequently rough, but small abalones

are abundant.

Mac Kerricher State Park, a few miles north of Fort Bragg on the Coast Highway, is our northern-most Mendocino dive site. This park has quite a bit of frontage on the ocean, and divers can enter the water anywhere they please. However, the southern portion of the park must be traversed on foot, and the central portion, accessible by auto, is dominated by a beautiful sandy beach. There is a parking area adjoining the beach from which divers can walk south toward and past the rocky area surrounding Laguna Point.

Shallow water with a rocky bottom is the rule here, which means small abalone and few good sized fish. This shoreline is exposed and often unsafe because of the rocks and surf, so very little tank diving is done here. On rough days the beach is great for body or mat surfing.

There are only two dive shops along the entire coast, and they are a long ways apart. The southern shop is in the town of Gualala, a few miles south of Anchor Bay. The other shop is a mile south of Fort Bragg. Both are on the Coast Highway. There are no dive services available between them, and presently there are no charter dive boats operating here. Also, the access across the airport on the north side of Gualala has been discontinued.

Now a few words about the weather, which often is not hospitable to divers. Winter storms kick up a lot of dangerous

surf and greatly reduce visibility. Yet between winter storms, after a week or so of calm weather, conditions will be good, and visibility will reach as much as 35 feet in rocky areas (water near sediment areas and rivers generally has continuous poor visibility). A spring shift in the winds usually brings calm to moderate conditions which will exist through the summer and fall. Your best bet is to call some coastal contact and get an up-to-date weather report, hopefully with observations about the water conditions during the last few days. Low cloud cover is common, but usually the water is calm then, and frequently the fog burns off.

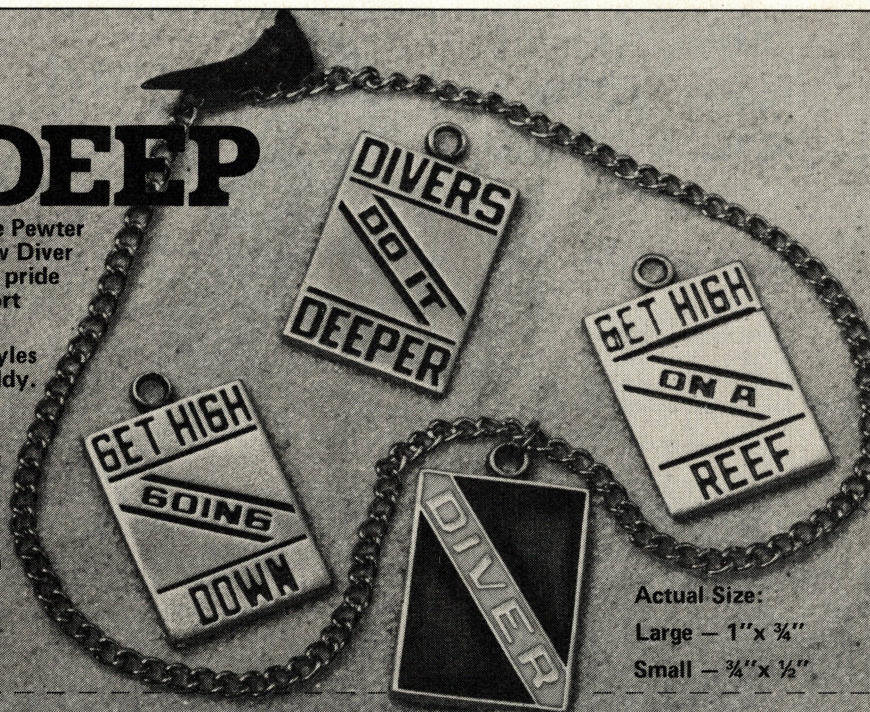
Accommodations, including motels, restaurants, stores and campgrounds are scattered along the coast and are generally available. I wish to emphasize, however, that the state parks on this coast are particularly beautiful, and each has a dive site that can be reached on foot from the camping area. Many divers take advantage of this situation, so often the parks are full during the summer and fall. Usually, private campgrounds can pick up any overflow.

Diving the Mendocino coast can be a multi-faceted experience. Big abalone, substantial fish populations, fantastic scenery and friendly communities combine to produce one of the most pleasurable areas to be found. Try it and find out for yourself what makes Mendocino "The Other California." 

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The registration fee is \$5 per diver. All proceeds will be donated to the Easter Seal Society to benefit thousands of physically disabled individuals in the Washington State area.

If you want to be a good egg and have fun at the same time, consider taking a dive so that a crippled child may walk. Contact Fred Harms at New England Divers, 11009 1st Ave. South, Seattle, WA 98168. Or call (206) 246-8156.

OREN MOST REPS RED SEA

Red Sea Divers, Ltd. has announced the appointment of Oren N. Most as the U.S. representative of Red Sea Divers.

Oren, a graduate of the Tel Aviv University, is former executive director of the Israeli Federation for Underwater Activities and marketing manager of Red Sea Divers in Israel.

Based in Los Angeles, California, Oren will conduct the 1979 Red Sea Year campaign in the U.S. This promotional campaign is supported by Red Sea Divers, El-Al Israeli Airlines, the Israeli Ministry of Tourism, major American tour operators and Seapen Books.

Red Sea Divers, Ltd. was founded in 1970 by an American investor, Howard Rosenstein, together with Michael Daniel, producer of the Red Sea Diver's Guide, and Yossi Kvashni, a marine explorer and navigator.

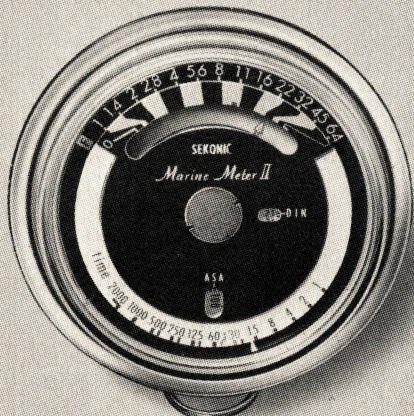
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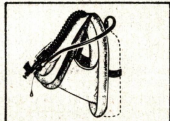
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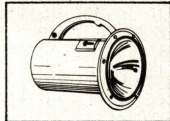
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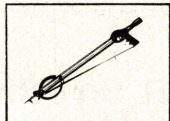
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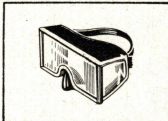
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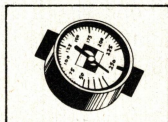
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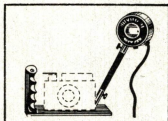
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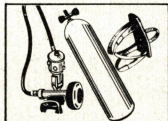
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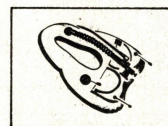
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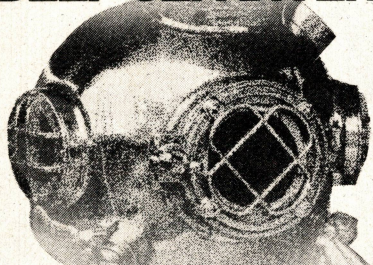
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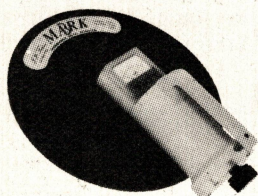
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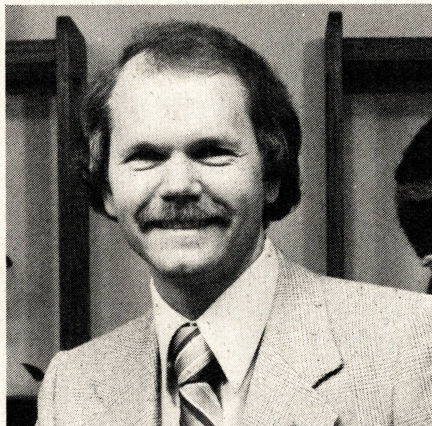
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U.S. DIVERS PROMOTES FORT

Grady Fort, former assistant to the vice-president of U.S. Divers, has been appointed marketing manager for the Aqua-Lung Division. Fort, who holds a degree in marketing from Texas A&M University, will be responsible for advertising, new product development, bud-

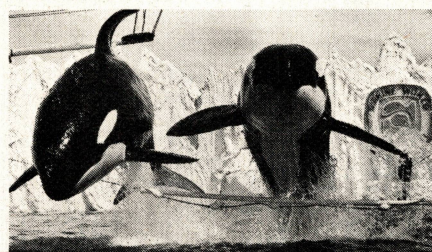


get planning, public relations and customer service.

A resident of Yorba Linda, California, Grady Fort has been with U.S. Divers for seven years and has served at various times as director of publicity, manager of customer service and director of new product development.

DIVERS DAY AT MARINE WORLD

The Central California Council of Diving Clubs and Marine World-Africa USA will present the Third Annual Divers Day at Marine World on May 13, 1979. The



day includes dive equipment displays, safety seminars, games, and a scuba swap. Ticket price includes admission to all Marine World shows and exhibits, Divers Day events, the private picnic area, a chance to win dive equipment in the raffle, and one free air fill at the Aquarius Dive Shop in Monterey.

Marine World-Africa USA is a 65 acre marine life show park, oceanarium, and African land animal preserve located 30 minutes south of San Francisco on U.S. 101 in Redwood City.

Tickets must be purchased in advance, at local dive shops or by writing Cen-Cal at P.O. Box 779, Daly City, CA 94017. Prices \$5.25, adult; \$3 child.

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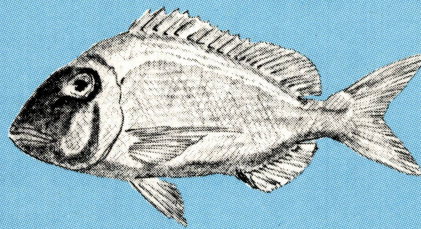
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The Jolthead Porgy

(*Calamus bajonado*)

Porgies are bottom-dwelling, fast moving, wary fishes that are difficult to get close to. They have no real standout characteristic that enables a diver to recognize them immediately or easily, except for the fact that they are silvery and look very much like the grunts (Pomadasyidae). Porgies belong to the Sparidae family, and in the West Indies they are represented by four genera: *Archosargus*, *Diplodus*, *Pagrus* and *Calamus*. *Calamus* is the largest genus of them all, represented in the Western Atlantic by 11 species. There are five *Calamus* species in the Bahamas. Ichthyologists James Bohlke and Charles Chaplin indicate that the *Calamus* group may be best identified by their facial looks: "long, stupid-looking," which is because of their deep preorbitals. □ *Calamus bajonado*, or the jolthead porgy, is the largest *Calamus* in the Bahamas, growing to between 22 inches and more than two feet. In the adult jolthead porgy, the snout is less steep than in the others (*C. penna*, *C. calamus*, *C. pennatula*). All of them look very much alike, with silvery bodies that can change according to the environment. The jolthead porgy is silvery, with scales that are pale blue/lavender in the middle part, and brassy peripherally (Bohlke and Chaplin). Some individuals show a pale brown head with a horizontal blue line between the eye and upper lip. (This area appears to be the shinier, smoother, slightly purplish area on our pictured specimen.) There is an orange



spot at the corner of the mouth. The young jolthead porgy does not have the prominent, pronounced features of the adult, particularly the slanting snout. Adults often have two horizontal white stripes on the face, one below the eye and the other between the eye and mouth. All of these colorations and markings can change, according to the environment. The jolthead porgy swimming over a white sand bottom will appear simply as a plain, gray fish. □ The jolthead porgy, like all other *Calamus* species, stays close to the bottom, over or near reefs. It is most often found in inshore

areas, in the deeper tidal creeks and around blue holes, but is also found at depths down to 25 fathoms (Bohlke/Chaplin). It is not "tied" or dependent upon reefs for shelter (Randall), but is extremely alert and very wary of the spearfisherman or diver. *Calamus* is carnivorous, the adults feeding primarily on sea urchins

(*Diadema*). Randall's study of the eating habits of *C. bajonado* determined that urchins comprise nearly half of its diet; the rest consists of crabs, pelecypods, gastropods, polychaetes, and hermit crabs. Porgies have strong molariform teeth, which crush the shells and spines of their invertebrate food with ease. The *Calamus* group is diurnal. □ The jolthead porgy is a common species found from New England (Rhode Island) and Bermuda, throughout the West Indies to Brazil, including the Gulf of Mexico. 🐟

Photo By Fred McConnaughey - Text By Hillary Hauser

The photo was taken on Molasses Reef in Pennekamp Park, Florida. McConnaughey used a Nikon F2 with a Nikon 55mm lens, Honeywell 782 strobe, in Oceanic housings. Shot at f16, 1/80 sec., 12-14 inches from subject.





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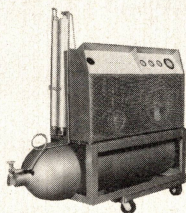
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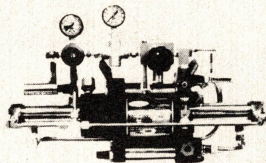
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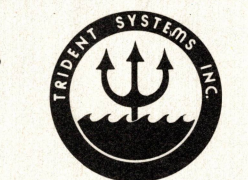
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GREENSTONE AWARD TO BILL HIGH

The 1978 Leonard Greenstone Diving Safety Award has been presented to Bill High, a leader in diver training and education for over 20 years. A past NAUI Branch Manager and member of the



NAUI Board of Directors, Bill has also served as NOAA's Diving Coordinator and helped revise the current NOAA Diving Manual.

Over the past 10 years, Bill developed and directed the North Pacific's Man in the Sea program, has lectured extensively across the country, and has written more than 60 articles on recreational and scientific diving.

The Greenstone Award is given each year to an individual who has forwarded the art and science of diver safety. Any member of the diving community may nominate individuals for this award.

For information, contact NAUI Headquarters, P.O. Box 630, Colton, California 92324.

HUMPBACK WHALE SANCTUARY

The Marine Wilderness Society presented Hawaii's Governor George R. Ariyoshi with the organization's formal resolution of support for the establishment of a federal Humpback Whale Marine Sanctuary in the waters between the islands of Maui and Lanai. Under the federal Marine Sanctuaries Act, Governor Ariyoshi is empowered to veto the marine sanctuary designation. The Marine Wilderness Society's resolution of support was also forwarded to NOAA's Marine Sanctuaries Office in anticipation of NOAA's publication in 1979 of a white paper evaluating the proposal for the Humpback Whale Marine Sanctuary.

The Marine Wilderness Society works to preserve marine habitats, protect endangered marine species, establish marine sanctuaries, and stop the pollution and abuse of the marine environment. For more information on the society's projects and membership, write: The Marine Wilderness Society, P.O. Box 943, Miami, FL 33165.

FRESHWATER EELS

The average American has never tasted eel, but in European countries and in the Orient, freshwater eel is considered a great delicacy. There is even a rapidly escalating demand for it.

The potential world market is estimated to be some 35,000 tons a year, and live elvers (baby eels) have been bringing as much as \$425 a kilo in Japan. Even three years ago in Europe, adult eel — jellied or smoked — was selling for \$6 a pound retail. It is thus not surprising that increasing numbers of American fishermen are turning to eeling, and exporters are setting up shop along the Atlantic Coast (that's where the eels go to spawn). The freshwater eel is not found on the West Coast.

North Carolina State University was the first educational institution to see the potential, beginning in 1972 with a Sea Grant funded project to develop a new fishery for the state. The project has returned more than \$10 million to North Carolina's economy. Other states with a growing fishery are Maine, Massachusetts, New York, New Jersey, Maryland, Virginia, and Florida. The U.S. eel boom has been triggered in part by Japan's water pollution and disease problems of the 1960's, which lowered stocks drastically, making it necessary to find new suppliers outside the country.

Eels are true fish, with gills and barely perceptible scales. There are 17 species, but only four — the Japanese, European, American, and Australian — are commercially valuable. These eels (the family Anguillidae) are catadromous — that is, they live in fresh water and go to salt water to spawn. And believe it or not, they are delicious! ➤

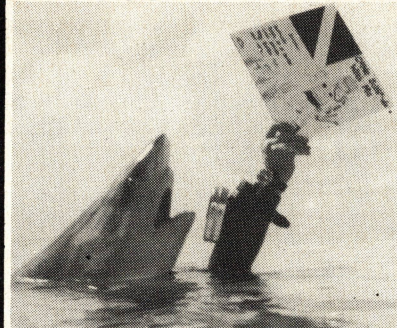
NIKONOS BOOK

Jim and Cathy Church, SDM photography editors, have a new publication out, *The Nikonos Book*. Designed to help underwater photographers learn to use the Nikonos system as easily and quickly as possible, it includes chapters on maintenance and flash units, wide-angle and close-up lenses and extension tubes. It tells readers everything they need to know about setting up and using a photography system based on a Nikonos camera.

Material for the book was obtained through the Church's experience in taking pictures underwater, teaching Nikonos photography to hundreds of students and through the researching and writing of two previous books and more than 100 magazine articles on the equipment and techniques of underwater photography.

The Nikonos Book has 96 pages and sells for \$4.95 at your dive shop. Dealer inquiries are invited. ➤

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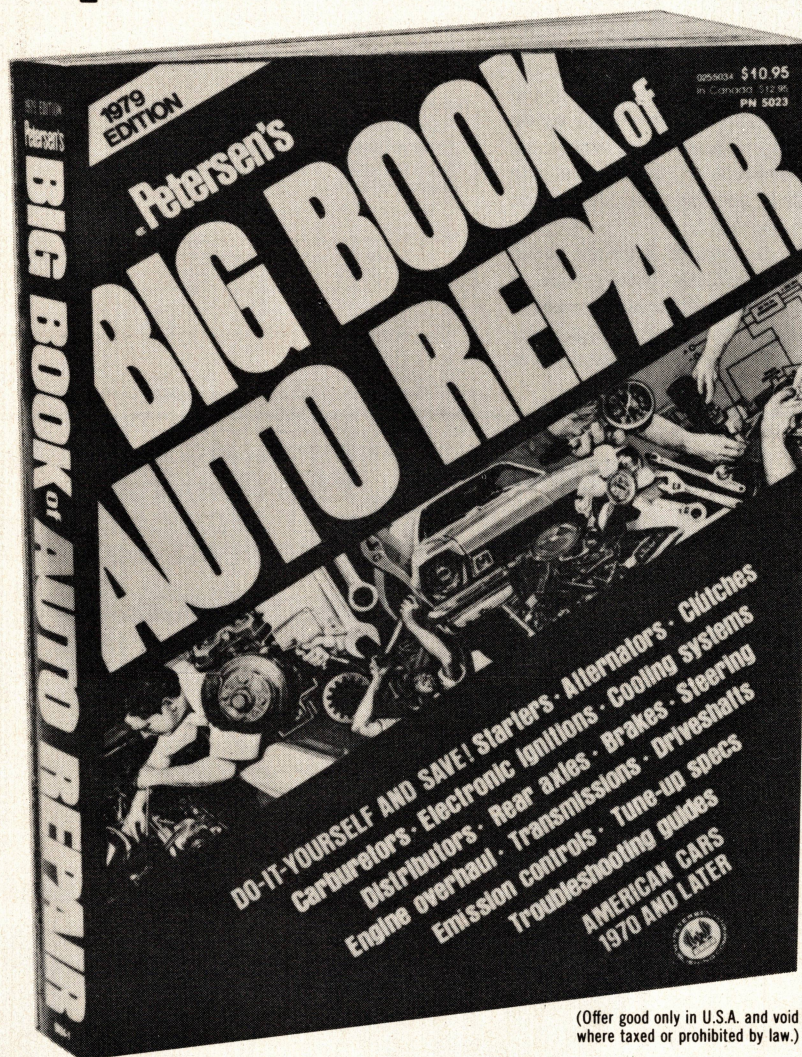
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PADI ECOLOGY COURSE

PADI International College in California, Inc., has announced a new addition to its professional 10 week "Gold" instructor curriculum. Students will participate in a 30 hour underwater bio-ecology course conducted by Dr. Hans Bertsch, Curator of Marine Invertebrates and Mr. David Mulliner, M.S., Research Associate, San Diego Natural History Museum.

The course will provide an introduction to common sea organisms. Topics include habitat, diet, life cycles, and reproduction of marine plants and animals. Lectures involve 18 hours. Twelve hours of field laboratory includes a weekend visit to Scripps Institute of Oceanography Aquarium and a boat dive at the Point Loma kelp beds.

This new addition to the regular 10 week curriculum is also offered to limited numbers of San Diego area divers as a portion of the college's Guest Lecture Series in Underwater Bio-Ecology.

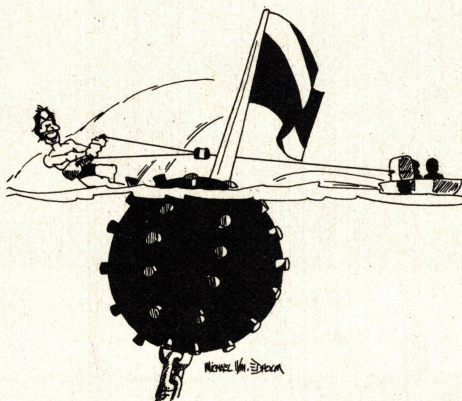
INMAN OPPOSES BEACH DREDGING

Hollywood, Florida dive store owner, Dave Inman, has voiced his opposition to

a U.S. Army Corps of Engineers dredging project off the Florida Coast. Inman believes the planned \$6.4 million beach renourishment program could destroy offshore reefs and their inhabitants.

Proponents of the program have promised there will be safeguards to protect the reefs and attendant marine life, which includes the American spiny oyster, a mollusk found only in the waters of South Florida and the Caribbean.

Inman and William Ridolph, also a member of the Hollywood, Florida beach and marine activities committee, have evidence that dredging has destroyed other reefs. They are planning to organize opposition to renourishing the Hollywood, Fla., beach by dredging.



SPECIAL U/W INSTRUCTOR'S COURSE

A new pacesetter course on professional underwater instruction will be offered in San Diego this June. The course has been designed to meet the needs of anyone who wishes to be professionally involved in the growing field of underwater instruction.

Integrated into the usual instructor level training will be material on counseling, communications, human relations, sensitivity and leadership. Techniques to be used include: group discussion, group decision making, problem solving, case study, role playing, guided discussion, brainstorming and values clarification. A particular emphasis will be on humanizing instruction to better deal with student needs. Much new material not yet in use in the field on open water techniques and the business of sport diving will be presented.

The course will be held at San Diego State University from June 15th through the 24th. Room and board is provided at the course site. College credit will also be available. Tuition will vary depending on your goals when attending the course.

If you are interested in participating in a truly professional underwater instructional experience, contact: Jon Hardy, Course Director, P.O. Box 634, Crestline, CA 92325. Or call (714) 338-2956.

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SDH49

SDM TRAVEL SECTION

WHERE TO GO/HOW TO GET THERE/WHAT TO DO

You're sitting on a dive boat with a dozen other divers. The fellow on your left was a Navy Frogman. He wears a snorkeling vest with an inflator hose so short you wonder if he could reach it in an emergency. The rubber on his mask is cracked, the glass cloudy. His fins are now found in museums, along with the ancient double hose regulator he uses. He spends his time quietly sharpening his knife.

The woman on your right is an instructor, now on her 734th dive which she will enter in her logbook immediately upon surfacing. Her equipment is well-used but modern. She carries a Nikonos with two strobes and has a goody bag in her BC pocket.

The guy in the corner has more gear than most dive shops stock. His knees are knocking, but he spins yarns about his conquests of the Jersey wrecks, California kelp beds, and frozen quarries back home. The guide quietly removes this man's regulator from his tank, turns it around, and refastens it the proper way.

Now how can a resort divemaster please such a wide range of people? He can't. And with safety his primary consideration, he'll seek a place with no current, no caves and no pelagic fish to ensure that the knee-knocker returns with everyone else.

If you're a novice diver, you'll welcome the slow start and safe diving. But if the knee-knocker doesn't improve after a few days, and you find yourself itching for more adventurous diving, then it's time to consult the divemaster. If you have demonstrated your confidence and competence, special arrangements might be made.

Larger resorts running more than one boat may team divers according to skills or arrange special dives for the best divers. A dive boat may anchor at the top of a wall, keeping the novices above, and directing the experienced divers down the wall. When buddies demonstrate great skill, they are sent on their own, allowing the divemaster to concentrate on those who need his

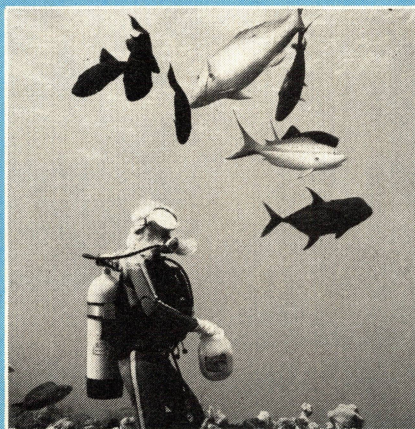
presence. At resorts where beach diving is available, buddy teams take off on their own.

The experienced diver finds out the diving style of a resort before signing up for a week's stay. By talking to personnel in his local dive shop and asking for names of people who have traveled to the resort, he can determine whether a resort is conservative and best suited for a novice or whether it is flexible and suitable for divers of different skills and interests.

A creative diver, however, can make the best out of any situation. You need not be a photographer to turn an average dive into an exciting one. You just need to take along a couple of gimmicks and apply a few special techniques to enhance the experience.

CREATIVE RESORT DIVING

By Ken Smith



For example, take a small plastic magnifying glass along to get a close-up look at corals, tube worms, and other creatures. A couple of different magnifying lenses are available which can be glued on the corner of your mask, making magnification handy.

Take along a waterproof fish book. If you're in the Caribbean, use Idaz and

Jerry Greenberg's *Waterproof Guide to the Corals and Fishes of Florida, the Bahamas, and the Caribbean*. With the book in hand you can see the differences between juveniles and adults, learn to recognize the different corals (you'll be surprised at the differences once you begin to study them) and be able to identify what *not* to touch.

During a dive, sit in one place, relax, breathe comfortably, and allow the fish life around you to return to normal behavior. You are no longer an intruder, you are a respectable member of a reef community. Observe the symbiotic relationships of the fish to one another. Look for a cleaner wrasse and its subjects; note the fish hiding in the stinging anemones. Observe aggressive behavior based on territory or food. Develop a list of questions which need answers. Why are flamingo tongues always on seafans? Why are small fish willing to swim a foot or two away from eels or groupers which eat them? Do they know when the predators are not feeding? Why are fairy basslets found under one ledge and not another?

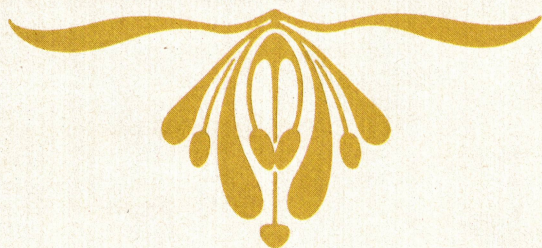
Get into the tactile sensations of the reef with a soft and gentle touch. Enjoy the grip of a crinoid on your finger, but don't yank your hand away, possibly breaking off a portion of the animal. Feel the mucus of corals; it helps keep the predators away and also helps catch food. Feel the stickiness of anemones. That stickiness stings and immobilizes tiny creatures and allows the anemone to slide them onto its dinner table. Most divers will have no physical reaction to any of these creatures. But if you are one who reacts strongly to insects, then you might forego the touching.

With imagination it is not difficult to enjoy any dive. There's far more life on a coral reef than one can ever describe or catalogue. By carefully exploring, reading about reefs, and asking questions, you'll be surprised how much you'll learn and how much more enjoyable each dive can be. >»



DIVING THE WIDE PACIFIC

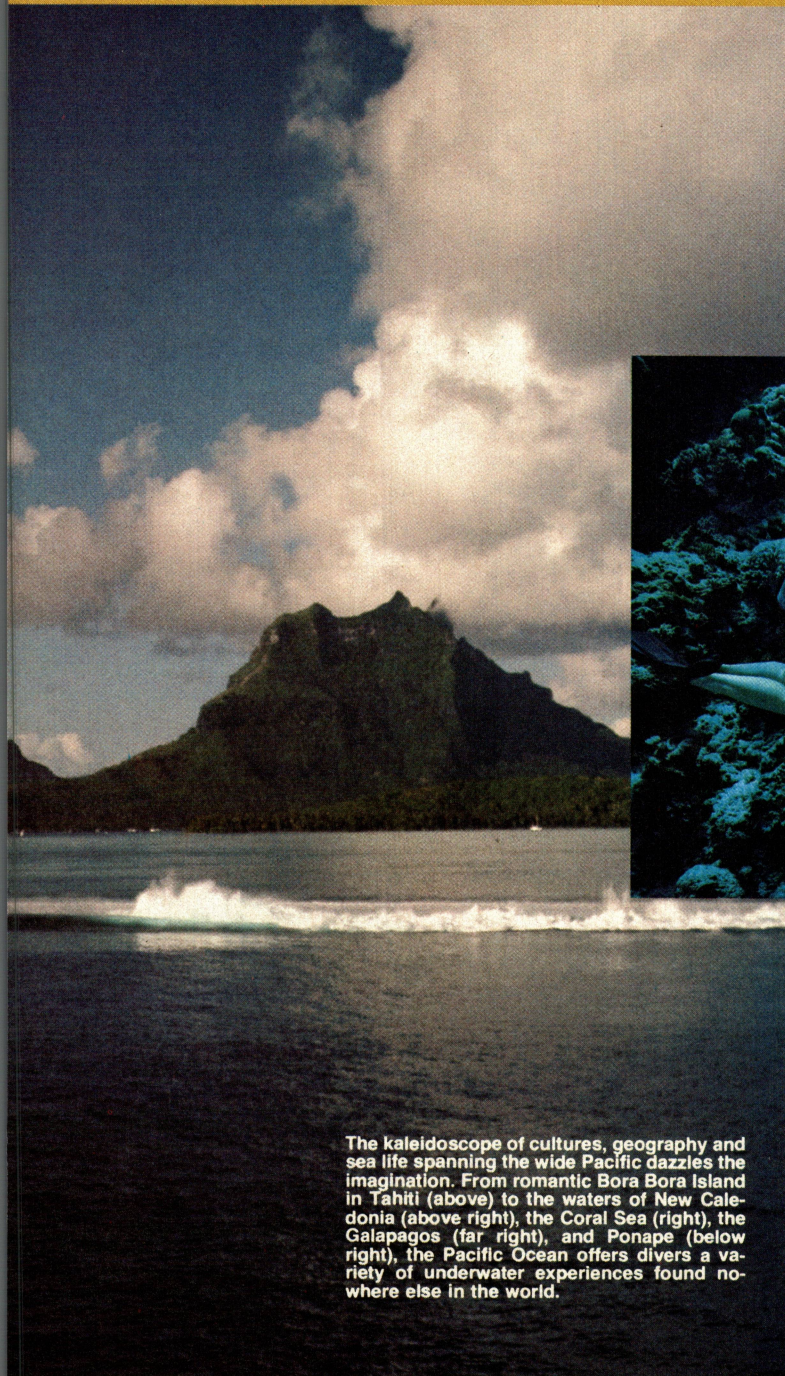
TEXT AND PHOTOGRAPHY
BY CARL ROESSLER



After a number of dive trips to Florida, the Bahamas or the Caribbean, divers inevitably begin to dream of new corals, new fish, new adventures — the legendary tropical paradises of the South Pacific.

For many years, the greatest barriers to the development of Pacific diving have been the cost of and regulations concerning air travel. The price of an air ticket to Australia or the Philippines exceeded the entire cost of a one-week dive vacation in the Caribbean. Moreover, airline regulations governing excursion fares required a stay of at least two weeks in most Pacific areas. Thus the cost of a Pacific dive trip was often triple that of a full-scale Caribbean dive trip.

Now, the winds of change are blowing. Divers are heading west in greater numbers, despite the costs. Meanwhile, airline deregulation promises a more competitive environment, with



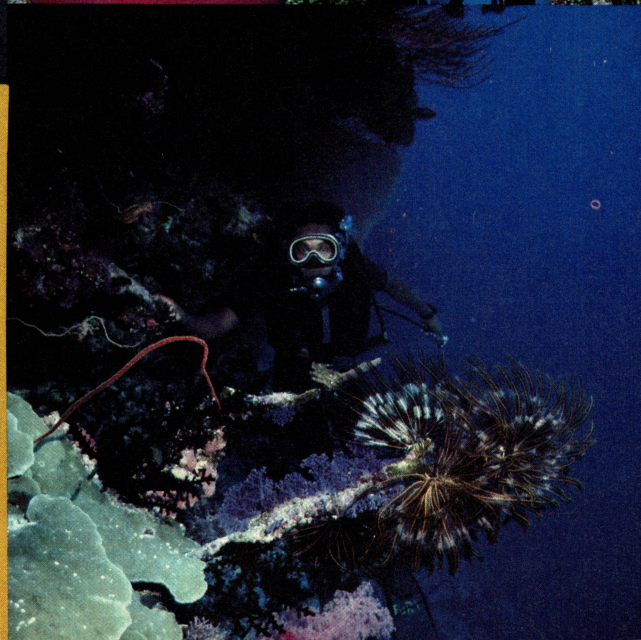
The kaleidoscope of cultures, geography and sea life spanning the wide Pacific dazzles the imagination. From romantic Bora Bora Island in Tahiti (above) to the waters of New Caledonia (above right), the Coral Sea (right), the Galapagos (far right), and Ponape (below right), the Pacific Ocean offers divers a variety of underwater experiences found nowhere else in the world.

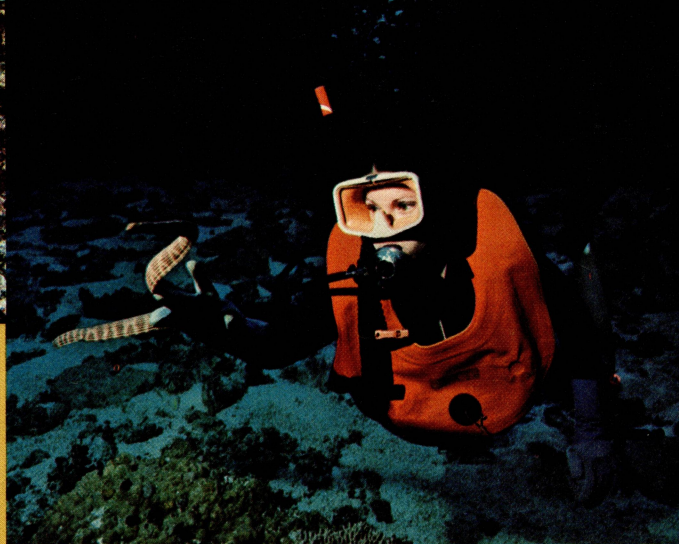
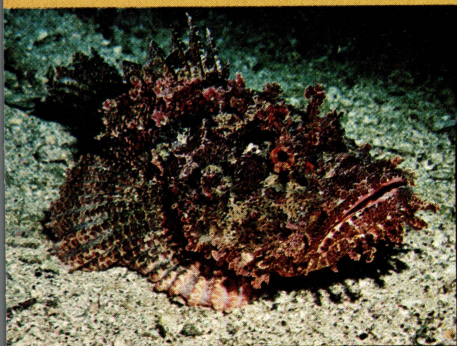


lower air fares and perhaps less stringent regulations, developments which will spur Pacific travel.

For American divers long used to the nearby Bahamas and Caribbean, the Pacific proffers a series of startling contrasts. To begin with, the traveler in the Pacific faces immense distances — up to 15 or more hours by jet, with several more hours stopover time enroute. For those accustomed to the one or two hour flights to such islands as Grand Cayman, this is something of a shock.

Another powerful impression is that of a kaleidoscopic variety of cultures, geography, and above all, sea life. For example, although they are all in the South Pacific, Tahiti, the Philippines and New Caledonia are incredibly different from each other. While they share the same basic marine fauna, each region has evolved unique patterns of marine development be-





Just a sampling of the variety of marine fauna found across the wide Pacific: from the Galapagos, a scorpionfish (top left) and a horse conch (bottom left); from the Coral Sea, sea snakes (center) and an octopus; and, from the Philippines, a snorkel-nose moray (below). Also below is New Caledonia's awesome grotto.



cause of its particular geography and location.

Despite their great beauty, Caribbean reefs have but a small proportion of the number of species found in the Pacific; the Caribbean has but 48 species of coral while the Pacific boasts over 600. One authority has identified no less than 92 species of damselfish in Australian waters alone, while the Caribbean has but 12.

Before venturing further, there's one question which always arises early: "Which place is best?" Each is a special experience unlike any other. Micronesia may (or may not) be the best for soft corals, Australia the best for sharks, the Philippines best for clownfish, and so on. Each, on its own, could provide you with the most rewarding dive vacation you've ever experienced.

One caution: When you are traveling such vast distances and unavoidably incurring higher costs, it pays to plan with great care. Be selective in your choice of dive programs, resorts and boats. An error in something like overweight lug-

gage tends to be magnified in the long-haul Pacific. By the same token, a long flight to a poorly-organized operation can lead to enormous disappointment. The best diving tends to be in rather remote areas. For this reason, live-aboard boats and off-the-track resorts can be the most attractive for experiencing the virgin reefs.

Another important caveat in the Pacific is to be very careful of the seasons. Each Pacific destination has a range of months which offer the year's best diving. In the Philippines it's February through June; in tropical Australia, September to November; in Micronesia, February through August; in Fiji, July through October; and so forth. Seek good advice on the weather when planning your trip.

With these few comparisons and cautions established, we now wing briefly across the wide Pacific, stopping for the highlights of each major destination. We will try to mention the particular marine life and cultural phenomena which help define this fabled new arena for American divers.

MICRONESIA

The Pacific dive area most divers recognize is Micronesia, largely owing to the extensive publicity given the 64 wrecks of Truk Lagoon. Truk deserves its fame, for the ghostly wrecks of the Japanese Imperial Fourth Fleet are an undersea experience with few equals in the world. Divers commonly visit more than 20 of these in the course of a full dive program. Many of the looming hulks are festooned with exquisite growths of soft corals in extravagant colors and sizes. In my opinion, Truk's wrecks are adorned with the largest and most colorful soft corals in all the world. Add to this a prolific population of sculptured stony corals, tropical reef fish, anemones, eels, etc., and many of the wrecks become isolated metal-based reefs of great beauty and lavish architecture.

While Truk is the primary destination of most divers traveling to Micronesia, a sizeable number have visited the islands of Palau, the farthest end of the island chain. Here are such sites as the precipitous wall of Ngemelis Pass, festooned with gorgonians and soft coral from the surface to beyond 200 feet.

A new star on the Micronesia dive scene is the lovely island of Ponape, equally exciting on land and underwater. The reefs are extraordinarily rich and relatively untouched, with great cascades of umbrella coral and stunning drop-offs in crystal clear waters. The island is also blessed with an awesome waterfall in the jungle and Nan Madol, the colossal ruins of an ancient civilization. Visiting these two sites both broadens dive experience and enriches the spirit.

TAHITI

The islands of Tahiti have exerted a siren call since the days of Gauguin, but American divers have not had easy times there. Dive equipment has been hard to find, while French divemasters have limited visiting Americans to one, or at most two, tanks per day and imposed other constraints.

The islands, particularly the high, mountainous Society Island group, are among the world's most beautiful. James Michener's fabled *Bali Hai* was based on Bora Bora, which many still consider the single loveliest island in the world. By contrast, the nearby Tuamotu group is composed entirely of low atolls with no central peaks.

Dive sites in both the Society and Tuomotu Islands are ex-

remely rich in reef fish, though the corals on the outer reef slopes are generally low-growing to withstand wave action. In the calm waters of the inner lagoon, fragile branching corals reach heights of 6 to 10 feet.

Some of the most exciting diving in Polynesian waters is in or near the passes, the channels through which vast flows of water move each day. Incoming tides send clear water rushing into the passes, and can offer superb glimpses of sharks, rays, jacks, barracuda and other pelagic fish which gather for the intense feeding the swift waters offer. Outgoing tides are less attractive and rather hazardous as silt-laden waters rush from the lagoon to the sea.

FIJI

This island group has dive sites which vary greatly in quality owing to specific local weather conditions. Suva, for example, has great rainfalls which severely impact its local coral reefs. However, on the opposite side of Vita Levu, the main island, there is spectacularly rich marine life on shallow coral formations at Mana Island. Mana's reefs have vertical walls of 100 feet or more with soft corals, crinoids, gorgonians and flashing tropical fish. An hour's flight north from Mana, the charming island of Taveuni boasts lush reefs, lovely bays for snorkeling and beachcombing, and a series of thundering waterfalls cascading through the heavy jungle.

Across the Somosomo channel from Taveuni lie perhaps the

most spectacular dive sites in the Fijis. Rainbow Reef, along the southern coast of Vanua Levu island, has a wall which plunges precipitously from 40 feet deep shallows. In one area called the Great White Wall, the vertical face glows with an incandescent blue-white field of soft corals swaying in the 90 to 150 foot depths.

South from Suva, Astrolabe Reef is an open-water site available only via live-aboard boats. Here is a lavish reef with huge caves, steep drop-offs and a wealth of pelagic and reef life. Each of these three areas has devotees and partisans insisting that it is the best of the three; suffice it to say that each has superb features to attract a devoted following.



This map not to scale

NEW CALEDONIA

This island group lies between Fiji and Australia, on the main air travel route to Sydney. New Caledonia's fame as a prime source of the world's nickel explains the wealth and sophistication of Noumea, its capital. Since the main island is high and mountainous, the effects of erosion and siltation limit diving there. However, two islands off the southern coast have well-developed reefs. Ile Ouen (Turtle Island) and Ile des Pins (Isle of Pines) both offer pleasant hotels and limited dive facilities.

The most exciting diving in New Caledonia is at Gadji Pass, an hour or more from the Relais de Kanemura Hotel on the Isle of Pines. Here a prodigious channel with immense tidal flows fosters prolific coral growth. Clouds of reef fish on the walls

contrast with stalking predators in the dark blue open world beyond. Perpendicular to the pass are earthquake-caused cracks in the solid limestone walls of the pass. In these wide cracks, relatively calm water offers superb diving and excellent opportunities for photography.

One novel dive at the Isle of Pines is the Grotto, an awesome flooded cavern beneath the floor of the forest! Enter a cave under a tree trunk and clamber down a sinister passage out of *Journey to the Center of the Earth*. The flooded cavern offers crystal-clear water with huge stalactites and stalagmites all about. This grotto is strictly for experienced divers, offering a sensational fillip to already great reef diving.

NEW HEBRIDES

These "Islands of Ashes and Coral" offer visitors a stunning mosaic of ancient and modern, natural and man-made wonders. Best-known to divers as the final resting-place of the ill-fated S.S. *President Coolidge*, the islands have two extremely primitive Indian tribes, an active volcano (on Tanna Island), a condominium government (jointly administered by Britain and France), daily earthquakes, and gracefully curved boar's tusks as legal tender between the natives.

While the islands have many beautiful reefs, wrecks and an underwater avalanche of surplus war material known as Million

Dollar Point, it is the *Coolidge* that lures divers here.

Turned back from a secret mission to avoid a lurking submarine wolfpack, the *Coolidge* hit two American mines outside Luganville Harbor. Deliberately run aground, she sank slowly enough to allow over 4000 marines and crew to scramble ashore. Today she is a colossal ghost of the sea a mere stone's throw from shore, with her bow only 60 feet beneath the surface. So enormous that only her forward third is safely diveable, this incredible leviathan is a proper diver's centerpiece for these charming and fascinating islands.

AUSTRALIA/CORAL SEA

Some of the world's most pulse-pounding dives lie in the Coral Sea, some 200 miles out to sea from the Queensland coast of Australia. Here, on free-standing oceanic reefs 100 miles beyond the outer limit of the Great Barrier Reef, clear blue waters combine with profoundly rich coral development for an ecstatic dive adventure. In addition, an intense population of sharks, sea snakes and other dramatic marine life add a dimension of excitement not found in other regions. Every dive includes sharks and sea snakes; after a few dives the visitor finds his or her anxiety diminished and his or her photo library enhanced almost beyond measure. The general topography of the reefs makes the diving easy; great pinnacles of coral as

large as office buildings arise from depths of 150-200 feet and soar nearly to the surface. The visiting diver can operate at snorkel depths for exquisite reef-top photography, or pick any level of deeper water to explore.

The waters of the Great Barrier Reef, while rich in marine life, tend toward limited visibility of 50 to 70 feet, compared to visibility ranges of 100 to 200 feet on the oceanic reefs. However, Great Barrier Reef diving is closer to shore, operates from island resorts and is less expensive per day than the more distant oceanic sites. The trade-offs of cost versus quality are perhaps more vivid in tropical Australia than most other areas of the diver's world.

PHILIPPINES

Even scientists wax eloquent about the marine fauna of these extraordinary islands. Sitting at the crossroads of several major ocean currents, the 7000 islands are blessed with species from Australia, the Indian Ocean, Japan and the Central Pacific. The result, not unexpectedly, is dramatic and unique diving and photography.

While so many islands offer countless good dive sites, it should be noted that a high proportion suffer from limited visibility. This is owing to relatively shallow water in the region, and a consequent lack of flushing action by deep-water currents.

Some of the finest diving in the Philippines lies in the central islands between Mindoro and Palawan. The largely uninhabited islands off the northern tip of Palawan jut like lonely rock sentinels from an untroubled sea. Around them assem-

bles a fantastic agglomeration of life, from rays and turtles and schools of jacks to exotic nudibranchs and unusual gorgonians. At Apo Reef, some hours north, I've found five species of clownfish in an area the size of a small table. Here the reef drops sharply into deep water; along the top of the drop-off clouds of spectacular purple fairy basslets mingle with diamond butterflyfish against a backdrop of iridescent blue fusiliers — an unforgettable panorama.

Photographers find not only incredible diving but a wealth of land photography — native villages, unusual islands, the sophisticated city of Manila, the War Memorial of the Pacific, the lonely and still-tragic bastion of Corregidor. All in all, the Philippines are an unforgettable and tremendously varied experience for even the experienced traveler.

THE GALAPAGOS

Last, and perhaps most exotic of all the Pacific regions are the enchanted islands of the Galapagos. Many writers have exhausted themselves of superlatives trying to describe the wonders of these remote volcanic craters on the equator, 600 miles due west of Ecuador.

Much of Charles Darwin's theory of evolution was shaped by his observations in the Galapagos, where hundreds of species evolved in near-total isolation after the islands were formed some five million years ago. The result is a phantasmagoric land where fully a third of the species exist nowhere in the world but here: — flightless cormorants, Galapagos tortoises, lava gulls, Darwin finches. And, in the sea, are new butterflyfish, marine iguanas, great starfish, penguins, giant scorpionfish, unique sea lions, giant sunfish, and even the now-famous wrasse-assed bass.

Unlike all of the other island groups in this survey, the Galapagos are surrounded by cool waters, with temperatures of 60-70°. This is because, despite their equatorial location, the Antarctic-born Humboldt Current washes their shores. Cold or not, the visiting diver thrills to both the uniqueness and the rich-

ness of the life he sees, and most are loathe to leave even after two full weeks of diving and onshore photography forays.

We have just made a quick survey of the Pacific in shamefully brief fashion. Each of these wondrous island worlds deserves articles or even books on their undersea marvels, and there are many I haven't even covered. For those who wish more knowledge of the marine life in these regions I recommend my book *The Underwater Wilderness* (Chanticleer Press, New York, 1977, 306 color plates). This volume is available at your bookstore.

For American divers, entering the Pacific is like finding ten new Caribbeans. Largely undeveloped and even primitive, it is now as the Caribbean was 20 years ago. Most of the reefs are virgin, and dive tourism is a trail blazed in a gigantic wilderness. With good preparation, such a wilderness can offer you a vacation beyond anything you've ever dreamed.

The cautions offered in the opening of this survey are well worth re-reading, for mistakes in the Pacific tend to be rather more costly than in the Caribbean. Get good advice, make your plans carefully, then head across the wide Pacific! 

CAYMAN.

From dry land, the gentle Caribbean ocean of the Caymans may seem like a lot of other oceans to you. But just a few feet below sea level there's an extraordinary world so beautiful you probably won't want to come up for air.

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SDC

SEE & SEA TO BELIZE

The great reefs of Belize lie 60 miles off shore, almost beyond the reach of shore-based dive boats. But now See & Sea Travel has two live-aboard dive boats operating in Belize. The *Belize Sundiver* and the *Isla Mia* each sleeps 10-12 divers, has spacious salons, fine food and unlimited diving. By using both boats in tandem, groups of 20 can be accommodated.

See & Sea's dive groups will see greater numbers of big fish here than at any other Caribbean destination. The secret is the remoteness of Belize's oceanic reefs, which has protected the big fish population.

For information, contact: See & Sea Travel Service, Inc., 680 Beach Street, San Francisco, CA 94109.

SEAQUATIC DIVERS

North Caicos is now open to divers. Seaquatic Divers has opened a dive facility at the Prospect of Whitby Hotel on North Caicos in the Turks and Caicos Islands. The operation will be run by two veteran divers, Mike Hogg and Allan Gardner. The Prospect of Whitby Hotel is a modern beach front hotel built in 1974. With its 25 air conditioned rooms

it is the largest hotel in the Turks and Caicos Islands.

The operation is equipped to handle up to 25 divers at a time. Equipment includes a Worthington 20 cfm compressor, a Mako 4 cfm compressor, and 50 aluminum tanks. There are three dive boats, a 34 foot Seadeck designed especially for diving, a 17 foot MFG, and a 20 foot Avon. Unlimited diving packages are offered with boat dives twice a day — a two tank dive in the morning and a one tank dive in the afternoon. PADI, NAUI, and YMCA certification programs are also offered.

North Caicos has more than 15 miles of virgin reefs including the dramatic beauty of the great wall dropping down 6,000 feet, and some of the most spectacular shallow reefs in the world.

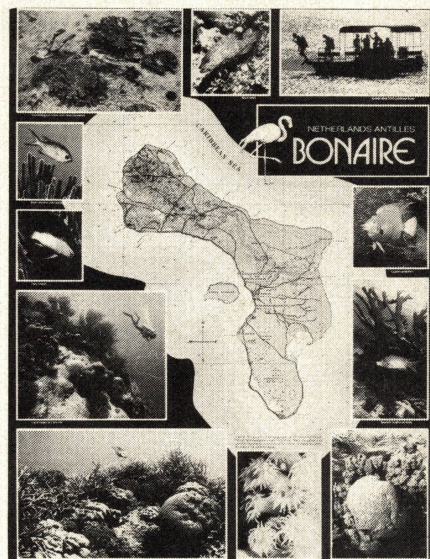
For information contact: Seaquatic Divers, R.D. #4, Box 1044, Middletown, NY 10940.

BONAIRE POSTER

The latest in a series of specialty diving posters by underwater photographer/author Jerry Greenberg depicts the Caribbean island of Bonaire, located in the Netherlands Antilles. The colorful poster features a map of the island, specially marked with depth statistics, and includes the location and name of the numerous dive sites.

Greenberg is well known for his dive

chart posters, having previously completed them for the islands of Grand Cayman, Cozumel, Buck Island, the Florida Keys and Pennekamp Park.



Dive Bonaire, located at the Flamingo Beach Hotel in Bonaire and owned and operated by Peter Hughes, has exclusive rights to the Bonaire poster, which may be obtained at the dive shop or the hotel's gift shop, Ki Bo Ke Pakus. For further information, write: Peter Hughes, Dive Bonaire, Flamingo Beach Hotel, Bonaire, Netherlands Antilles.



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*Based on double occupancy. Airfare not included.

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Send brochures on diving tours of ☐ Maui ☐ Kona ☐ Spirit of Adventure
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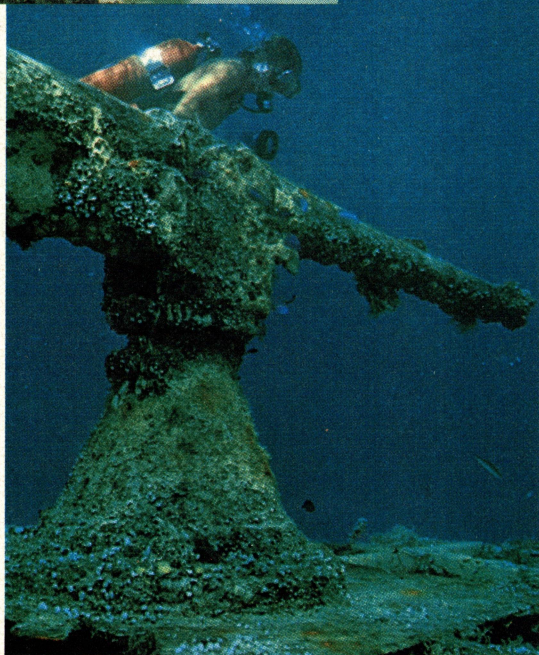
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CONTINENTAL/AIR MICRONESIA



The cost of going down is going up June 1st!

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With receipt of your deposit before June 1, 1979, we will reserve your right to travel with us any time in the future at pre-June 1st prices.

The Spirit of Adventure is a custom built diving cruiser. Almost 90 feet long and 25 feet wide, she can accommodate 30 live-aboard passengers in style.

The attentive, well-trained crew, will show you Hawaiian diving that few natives ever see. Life aboard the Spirit is relaxed and casual, a "barefoot" cruise; a vacation with all the great diving you can handle. The food is well prepared and the varied menu is always delicious and generous.

Come join us for a great diving vacation and let us put a little Hawaii in your blood.

Remember, reserve before June 1st and save a bundle.



PARKER AND O'NEIL TO SOUTH CAICOS

The Admiral's Arms Inn on South Caicos, W.I., has announced the appointment of Steve Parker and Earl O'Neil as dive instructor and divemaster for aquatic activities at the inn.

Steve and Earl bring with them a wealth of experience in dive operations, tour leading, underwater photography and small craft handling. They join Joe and Judi Esposito, the inn's managers, to form a highly experienced group of dive instructors and assistants devoted to serving the inn's dive guests.

For an opportunity to dive with Steve and Earl along scenic reefs and spectacular drop-offs, contact: Co-Pilot Travel Consultants, 6201 Leesburg Pike, Falls Church, VA 22044.

SCUBACAMP PROGRAM

This year boys and girls ages 10-15 who attend the 1979 Scubacamp, held each July and August at Rum Point Club, Grand Cayman Island, will obtain first-hand experience in tropical marine and terrestrial systems.

Under the direction of Dr. Joseph Britton, associate professor, department of biology, Texas Christian University, the children will study the inhabitants of the sand beaches, the communities of the rocky intertidal zone and the turtle grass beds, and the ecological system of the mangrove, as well as the corals and coral reefs in deeper water.

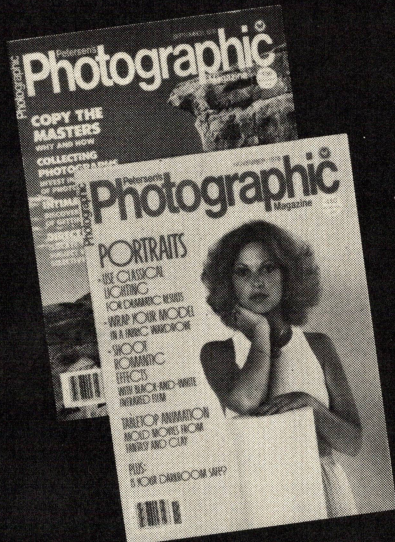
At the beginning of each session, campers will be given careful instruction in scuba, followed by shallow dives in the quiet lagoon within the barrier reef just off Rum Point. When the class studies reef structure and coral identification, the children who have attained the necessary skills will use diving as a tool to observe and identify the inhabitants of the reefs around Grand Cayman.

The all-inclusive fee of \$1300 for each session (July 1-28; August 1-28) covers the cost of Dr. Britton's tropical science course, scuba lessons, at least 20 dives per camper, accommodations, meals, equipment rental, and all extra activities. Each camper is responsible for his or her own transportation costs.

For further information, contact: Thelma Clark, Scubacamp Director, 200 Ansel Rd., Geneva, OH 44041.

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MARTINIQUE DIVE CENTER

Martinique, in the French West Indies, offers a well-equipped full service dive center on the premises of the Hotel Meridien. Bernard LeGrand, master diver and owner, has 15 years of experience in training and diving. Bernard and his instructors provide a variety of dive experiences on their 37 foot boat *Bucephale*. From drift dives to



walls, from shallow water to the fabulous Diamond Rock, Martinique is a wonderful dive resort.

For further information, contact: Bernard LeGrand, International Diving Center, Hotel Meridien, Trois Ilet, Point du Bois, Martinique, W.I.

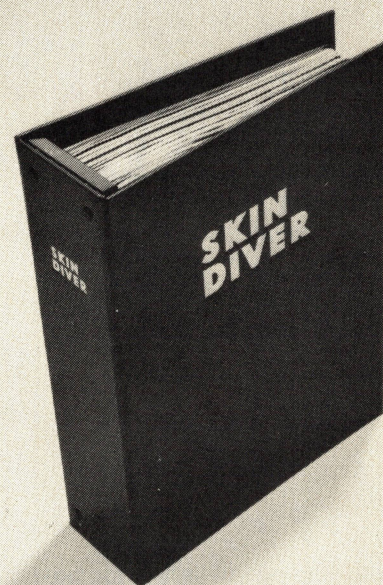
SUMMER SEA CAMP IN MEXICO

The third session of Camp de Mar in Zihuatanejo, Mexico will begin June 15. This will be an international scuba instructor's certification program and will be followed by the regular camp session which starts July 1st and lasts six weeks. Camp de Mar features Spanish or English language, sailing and seamanship, physical fitness, marine biology and ecology, surfing, and a 35 hour certification course in scuba diving. A number of optional activities are also available.

Camp de Mar is an annual feature of the Nature Study Center on Las Gatas Beach which seeks to encourage a new ethic regarding human relationships with nature. Co-ed enrollment is limited to 30 persons who are good swimmers, 16 years of age or older and in good health.

The tuition per student is \$200 per week or \$1000 for six weeks. This includes full room and board, use of all sport facilities, sailboats and scuba gear. Students should bring their own personal gear, such as masks, snorkels, fins, cameras, spearguns, fishing reels, or surfboards. The fee does not include airline fares or personal effects. Typical round-trip air fares to Zihuatanejo on the package plan are: New York City \$220; Los Angeles \$200. For further information and reservations contact your travel agent or write Camp de Mar, 548 LaGuardia Place, New York, New York or Apartado Postal 81, Zihuatanejo, Gro. Mexico.

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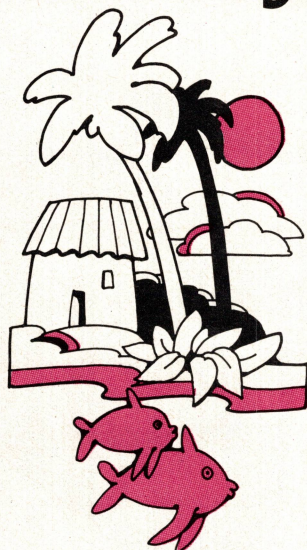
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Divers Directory



Advertising rate is \$70 for three consecutive ads, \$120 for six consecutive ads, \$185 for a full year. **PAYMENT MUST ACCOMPANY COPY.** Send all material to Diver's Directory, c/o Skin Diver, 8490 Sunset Boulevard, Los Angeles, California 90069.

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Repair - 3500 PSI Air Station

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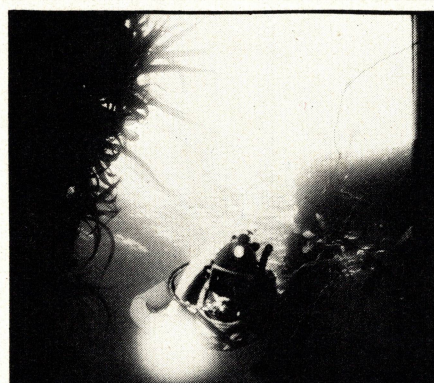
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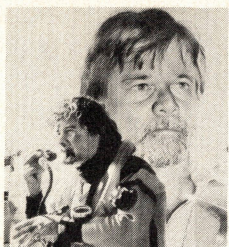
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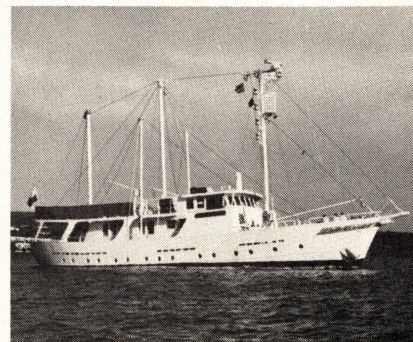
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The *Pelorus Jack* is now available for charter in the U.S. and British Virgin Islands. The boat can accommodate up



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For information regarding charters contact: Jim Hapgood, Box 5039, St. Thomas, U.S. V. I. 00801.

ALOHA DIVE SHOP SPECIAL

Honolulu's Aloha Dive Shop in suburban Hawaii Kai is offering a special diver's gift. The Aloha Super Gift Special is a 14 kt gold weightbelt, billed as the "world's first anti-inflation, anti-buoyancy device." Also included in the special gift package are hotel accommodations and private scuba instruction.

The specially-designed gold weightbelt is completely engraved with Hawaiian motifs and includes a personalized buckle designed by owner Gene Rieth of Koko Marina Jewelers, located near the Aloha Dive Shop in the Koko Marina shopping center about 10 miles from Waikiki. Creative jeweler Harlan Talkington custom molded the gold. Prices start at \$14,004 for a six pound belt.

NEW PROSPECT REEF UNITS

Prospect Reef Resort and Harbour on Tortola in the British Virgin Islands has opened 26 additional units. This makes Prospect the largest resort in the British Virgin Islands. Executive director, Elihu Rhymer, said the resort will add another 52 units in December.

Prospect has a sailing school, a fleet of charter yachts, deep sea fishing facilities and six Laykold tennis courts, two of which are for night play. It recently acquired the services of tennis pro Debbie Wilson.

Prospect Reef Resort and Harbour is represented in the U.S. by Prospect Leisure, 515 Madison Avenue, New York, N.Y. 10022; and in Canada by Prospect Leisure, 7 Wabash Avenue, Toronto, Ontario M6R 1N1.



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CAYMAN COLOR PROCESSING

As a special service to the visiting underwater photographer, Ron and Nancy Sefton are now offering overnight processing of Ektachrome slide films (E6), twice weekly on Grand Cayman Island.

This service is designed especially to help the photographer with new equipment, or one who is taking pictures in tropical waters for the first time to find out early in his vacation if his equipment is functioning properly and exposures are correct.

In addition, the Seftons also provide a repair service for underwater photo-



graphic equipment, exposure charts for Cayman reefs, and general advice based upon their eight years experience diving and taking pictures in Cayman waters.

The slide processing service is being offered both through Sefton's Undersea Photo Supply near George Town, Grand Cayman, and through Spanish Bay Reef and Spanish Bay Villas Resorts. Visitors wishing to take advantage of overnight processing should plan to shoot Ektachrome E6 slide films only. For further information and rates, write air mail to Nancy and Ron Sefton, P.O. Box 1200, Grand Cayman, British West Indies.

RED SEA PADI FACILITY

Neviot Diving Centre, Israel, is now a fully sanctioned PADI Training Facility. Situated on the shores of the Red Sea, Neviot offers full hotel and resort facilities as well as a fully equipped and newly extended dive center.

PADI and CMAS certification courses are run year-round and plans for the future include specialist courses in night diving and underwater photography.

Twice each month, Neviot also provides week long diving "seafaris," which travel the coast, visiting the finest dive spots, either by air-conditioned bus, or, as conditions dictate, four-wheel drive jeep.

For further details, contact Martin J. Sutton at Neviot Diving Centre, Post Eilat, Israel.

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Above & Below, 10 Strand Street, Frederiksted 00840. Tel.: (809) 772-3701
Caribbean Sea Adventures, Kings Wharf, Christiansted 00820. Tel.: (809) 773-6011
North Star Dive Tours, Box 3461, Christiansted 00820. Tel.: (809) 778-0825
Pressure Ltd., Box 3612, Christiansted 00820. Tel.: (809) 773-2678
V.I. Divers, Ltd., PanAm Pavilion, Christiansted 00820. Tel.: (809) 773-6045

St. John: (Zip Code 00830)

Caneel Bay Plantation, Caneel Bay, Tel.: (809) 776-6111

St. John Watersports, Box 161, Cruz Bay, Tel.: (809) 776-6256

St. Thomas: (Zip Code 00801)

Aqua Action Inc., Wintberg Peak, Tel.: (809) 775-3275

Bolongo Bay Beach & Dive Club, Box 3381, Tel.: (809) 775-1800

Caribbean Divers, Red Hook, Tel.: (809) 775-1935

Frenchman's Reef Undersea Centre, Charlotte Amalie, Tel.: (809) 774-8500

St. Thomas Diving Club, Box 4976, Tel.: (809) 774-1376

Virgin Islands Diving School, Box 9707, Tel.: (809) 774-8687

Joe Vogel Diving Company, Box 7322, Tel.: (809) 774-2321

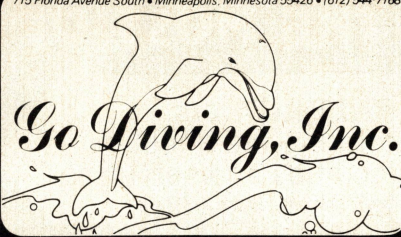
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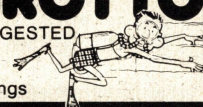
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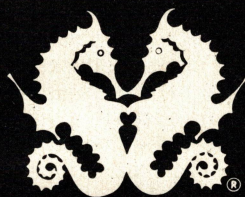
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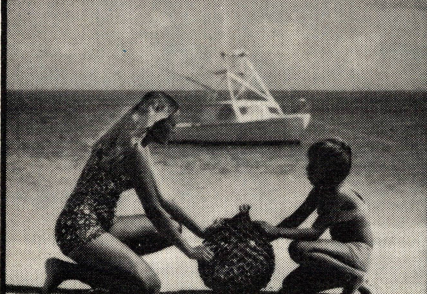
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EDITORIAL (Continued from Page 4)

ernments have neither the financial resources nor the interest in establishing an expensive cadre of marine police. The ocean is vast and it is virtually impossible to patrol it constantly. Instead, most dive boat skippers and underwater guides have become volunteer marine wardens. These "coral cops" keep a constant vigil for poachers and report their illegal activities to the local police. In addition, they take the time and effort to educate their guests about local marine conservation regulations. In some cases they ward off potential lawbreakers by threatening to report them. All of this effort is done without pay and with little hope of recognition, but the dive operators fully realize that they are saving their own business by saving their reefs from annihilation.

Perhaps there is a lesson to be learned from the current conservation trend among the Caribbean islands. The struggle for marine conservation cannot be won by merely organizing a conservation association, publishing a newsletter and collecting dues. While such activities may be helpful in organizing such a movement, the real battle must be fought at sea. Too often Americans expect their government to do everything for them. They expect a rousing newspaper article or an impressive political speech to make things right, but it never happens this way in real life. If there is anyone who is going to successfully save our marine environment, it will be divers. We are the only ones who care enough and are capable of policing and protecting the underwater world. By working together, divers and local governments can establish effective conservation regulations that can save our reefs. It is beginning to happen in the Florida Keys right now and we expect this concept to spread to other parts of the U.S. Those who make a living and benefit from the sea must be prepared to protect it. >

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PHYSICIANS U/W MEDICINE PROGRAM

The 15th International Physicians Underwater Medicine Program (Physiology and Medicine of Sport Diving) has been scheduled for June 29-July 11 at the Truk Continental Hotel. The program will be co-hosted by Micronesia Aquatic Center.

In more than 25 classroom hours, illustrated lecture sessions will cover the history of dive medicine and review dive physiology, physical standards for divers, effects of elevated partial pressure, mechanical effects of pressure change, decompression theory, decompression sickness, near drowning, poisonous and venomous marine life, sham treatments, case discussions and special topics seminars.

In addition to the medical seminar, daily excursions will be scheduled in one of the world's finest wreck diving areas. All diving will be done during non-lecture hours.

Travel and diving arrangements for the 15th International Physicians Underwater Medicine Program are being handled through Lee Turcotte's Atlantis Safaris, Miami Shores, FL. For a brochure and further information, contact: PUMP, P.O. Box 530344, Miami, FL 33153.

PLANET OCEAN'S ATTENDANCE RECORD

Planet Ocean, one of the fastest growing attractions in South Florida, broke all of its previous attendance records during 1978. Attendance at the three-year-old permanent ocean exhibition increased 14 percent over the 1977 figure.

Julian Hamilton, administrator of visitor relations of the Florida Division of Tourism, commented, "The Planet Ocean gains indicate tourism in South Florida is increasing." Hamilton said Planet Ocean's figures show significant tourism increases that also reflect well on other South Florida attractions.

The Planet Ocean record breaker, with daily attendance exceeding 2,000 persons, followed the opening of a new major theme, which drew holiday visitors and local residents. The new exhibit takes visitors through a giant microscope and into a drop of water where they travel along a moving sidewalk amidst sea life.

There are more than 100 exhibits in the \$6 million, 100,000 sq. ft. exhibition. The exhibits include an indoor cloud and rainstorm, a hurricane in captivity, an iceberg and a submarine. Planet Ocean is operated by the non-profit International Oceanographic Foundation, with 60,000 members worldwide.

Check list for a perfect dive vacation...

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Easy jet flights from anywhere within North America. Divers should have a chance for an afternoon dive the first day.
- ☒ **CONVENIENT DIVE LOCATIONS.**
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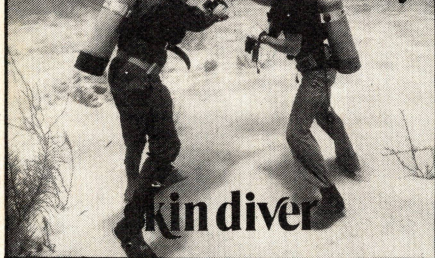


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PADI BENEFITS PACKAGE

Training facility director, Al Hornsby, has announced a major new benefits package for PADI Training Facilities. Through an agreement with Support Services Alliance, Inc., a non-profit organization dedicated to aiding small businesses and the self-employed, for the first time store owners can take full advantage of many group benefits available only to executives and employees of large companies.

Hornsby noted, "One major problem we face as an industry is attracting and keeping aggressive, talented people at the retail/instructional level. On countless occasions, we have witnessed the following sequence: a bright, capable individual works for a year or two in the retail dive market; then, due to pressures from starting a family or planning future security, is forced to move on to employment providing life insurance, medical coverage, disability plans and other employee benefits normally furnished by large corporations. The loss of talent and potential to our industry is staggering."

Through the efforts of PADI and SSA, a program to offset this serious problem and benefit store owners and their families is now available to the dive industry. Included in this package are life, medical, and disability insurance plans; a discount on Hertz Auto Rentals; a discount on Xerox equipment rentals; legal referral and inquiry services, and educational loan guarantees.

For complete information, contact: Al Hornsby, PADI Headquarters, 2064 N. Bush Street, Santa Ana, CA 92706.

PADI ITC AT SOUTH CAICOS

The Admiral's Arms Inn on South Caicos Island, West Indies, will host a PADI Instructor Training Course, June 24 to July 1, 1979. The inn will be the scene of classroom presentations, pool demonstrations and open water evaluations as the candidates seek to earn the rating of PADI Open Water Scuba Instructor. Candidates will find the inn an ideal setting in which to train. The warm, clear waters along with the hospitality of the inn and its dive shop combine to meet the candidate's every need.

The inn is offering a special ITC travel package featuring reduced air fare and diving rates to prospective candidates. For information concerning this special package, contact: Co-Pilot Travel Consultants, 6201 Leesburg Pike, Falls Church, VA 22044.

Prospective candidates desiring more information about specific prerequisites for this unique ITC should contact: Dave McKnight, Course Director, 84C Walnut, Ft. Devens, MA 01433.

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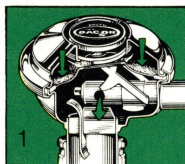
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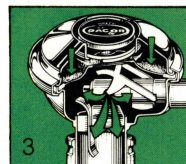
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As the diver continues the inhalation cycle, the second stage lever continues its downward movement (see drawing #2). At this point, as in the beginning of inhalation, the partial vacuum under the diaphragm is holding it down, relieving the diver of doing so with lung power.



At the height of the inhalation cycle, the lever is further depressed (see drawing #3) and at this point the *Venturamatic Flow Vane* comes in contact with the flow of air entering the mouthpiece. This *Flow Vane* is designed to meter the right amount of air entering the mouthpiece while deflecting a certain portion of the incoming air into the regulator which helps to diminish the partial vacuum, and to prevent the unit from free flowing if the diver should take the unit out of his mouth.

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